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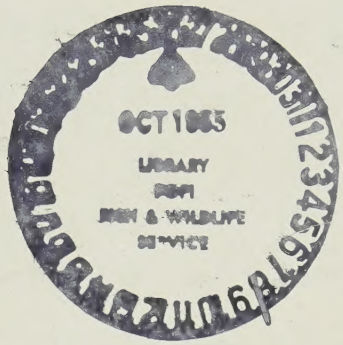
SOUTH PACIFIC COMMISSION



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PUBLISHED BY THE SOUTH PACIFIC COMMISSION, NOUMEA, NEW CALEDONIA

THE SOUTH PACIFIC COMMISSION

The South Pacific Commission is an advisory and consultative body set up by the six Governments responsible for the administration of Island Territories in the South Pacific region. Its purpose is to recommend to the member Governments means for promoting the well-being of the people of these territories. It is concerned with social, economic and health matters. Its headquarters are at Noumea, New Caledonia.

The Commission was established by an Agreement between the Governments of Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America, signed at Canberra on the 6th February, 1947, and finally ratified on the 29th July, 1948. Until the 7th November, 1951, the area of the Commission's activities comprised territories lying generally south of the equator from and including Netherlands New Guinea in the west to the French Establishments in Oceania and Pitcairn in the east. On 7th November, 1951, an additional Agreement was signed at Commission headquarters in Noumea on behalf of the six participating Governments, extending the scope of the Commission to include Guam and the Trust Territory of the Pacific Islands under United States administration.

The Commission consists of twelve Commissioners, two from each Government, and from 1948 until 1953 met twice a year. It now normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

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The Research Council, which assembles once a year, held its first meeting in May, 1949. Members are appointed by the Commission, and are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Suva in April, 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April, 1953.

The Commission's staff includes six principal officers, as follows: Secretary-General, Dr. Ralph C. Bedell; Deputy Chairman of the Research Council, Dr. E. M. Ojala; Deputy Secretary-General, Mr. John Ryan; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Mr. H. E. Maude, O.B.E. The Deputy Chairman and the three Executive Officers are ex officio members of the Research Council. The principal officers are supported by a small technical and administrative staff.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Noumea, New Caledonia.

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THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

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Development Is Under Way Of . . . .

Fisheries In The South Pacific

Administrations throughout the Pacific are showing increasing interest in the development of their fisheries, as this survey reveals.

By H. VAN PEL*

The fishing chief of a New Caledonian tribe poling his pirogue on a reef-fishing expedition. At present Pacific islanders catch their fish mainly in shallow waters—in lagoons and over fringing reefs—and these areas are often over-fished. Fish production cannot increase significantly until the open ocean is exploited by modern methods.

IN the South Pacific there is an enormous expanse of water, but the people of the region are fishing only the small areas they are able to reach. Professional fishermen in the true sense of the word are few, but in many places fishing is a part-time occupation in which even women and children engage, so that it can be said that almost everybody participates.

Often, craft are not used for fishing. When they are, they consist mostly of canoes, which may be fitted with one or two outriggers. Sometimes several canoes are joined together as a single craft, as in Papua. While they may be used for fishing, they are usually intended for other purposes. In a few places European-style open boats or small motor launches can be found.

Fishing gear can be of many different types, usually simple, but always good if one takes the circumstances into account. It includes various types of spears, bows and arrows, snares, hook and line, cast-nets, surrounding nets, beach seines, gillnets, traps, dragnets, dipnets, scarelines, lures and many others.

The variety of produce which can be taken from the sea and fresh waters in this area is such that I will give only a few examples: sea, brackish and freshwater fishes of many species, mammals ranging from the sea cow to whales, lobsters, shrimps and crabs, shells (of which some are excellent food, while others provide an important export item), turtles, edible aquatic plants, sponges, various kinds of coral, salt. This list includes minerals as well as animal and vegetable life; yet only the most obvious items have been indicated.

There is very little fishing done by Pacific islanders out in the open ocean. Fish farming is also negligible. The main activities take place in comparatively shallow waters—in lagoons, over fringing reefs, and in inland waters. These areas are often over-fished and it is perhaps fortunate that, in general, Pacific islanders have not yet evolved methods for exploiting the deeper parts of lagoons; otherwise the resources of these comparatively shallow waters would be completely exhausted by now. While it is often thought that the resources of the sea are inexhaustible, we are dealing here with reefs and lagoons, where the marine life cannot be replenished from the open ocean beyond and which can be exhausted many times faster than nature can restore it.

As it is, fishing provides one person with about enough for his daily meals. The situation is improved slightly when pelagic fishes, travelling in schools, enter the lagoon or come near shore, and can sometimes be caught in appreciable quantities. On the other hand, I regret that explosives and vegetable poisons are used to a certain extent for fishing. Neither practice should be tolerated; more particularly the former, as explosives destroy the aquatic flora and fauna *and disturb natural environments* so much that recovery is extremely slow and often incomplete.

It should not be thought that fish only are affected by over-fishing; shell beds, whether trochus or mother-of-pearl oyster, have been severely depleted in most places.

The most developed fisheries industries of the area are to be found in New Caledonia and French Oceania, where small motor boats are used for various types of fishing.

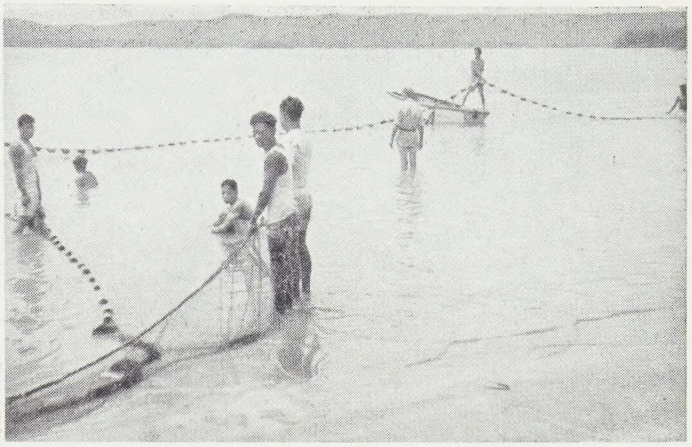
Some unusual industries must be included in the field of fisheries. Humpback whales breed in tropical waters and are often observed travelling through the Tongan Group, with their calves. There, a whole family engages in whaling, pursuing their quarry with hand harpoon in small rowing and sailboats. The purpose is mainly to provide fresh meat for human consumption.

In the Fijian and Samoan Islands the rise of the famous "palolo" worm (which, actually, is not a worm) is eagerly awaited by the population.[1] Sea cucumber (beche-de-mer) no longer gives rise to any great activity since the Chinese markets are closed, but in Tonga, a liquid extracted from the internal organs of this creature is bottled and sold as a medicine. Some sea urchins are considered a delicacy in New Caledonia.

* Mr. van Pel is Fisheries Officer to the South Pacific Commission.

1 See **The Rising of the Palolo,** "S.P.C. Quarterly Bulletin," Vol. 3, No. 3, July, 1953.

Instructions in net mounting in Netherlands New Guinea.



Fishing with beach seine in Netherlands New Guinea.

Other types of fisheries are more conventional, although limited to small areas. In one particular bay, Tongans find excellent mussels; in the same Group there is a saltwater lake with no known communication with the sea, where, contrary to expectations, the well-known Milkfish (*Chanos chanos* Forsk) has been observed to breed[2]. The rivers of Fiji yield excellent freshwater mussels. Mangrove oysters of good quality can be found in Fiji and New Caledonia. There is little shrimpfishing done in the area, but the people of the south coast of Netherlands New Guinea catch quantities of these crustaceans.

In most of the islands mullet can be found, sometimes in numbers; these schoolfish are caught in traps, and unfortunately also with explosives.

Spiny lobsters of various kinds are sought, especially in the neighbourhood of European settlements. Turtles are found everywhere and their eggs are also appreciated. Large mangrove crabs, very good to eat, can be caught in many territories.

Many species of shellfish are edible, and their beautiful shells may in some cases be highly prized as collector's items or as ornaments. Among these, pearl oyster and trochus, as well as green snail (Burgau) occupy the most important place, as their pearly shells command a good price in European countries. In French Oceania the half shells of large pearl oysters are frequently carved into ornaments and curios. In Fiji, two factories turn shells into buttons and the beautifully spiralled shells of a *Turbo* are often made into handsome lamps.

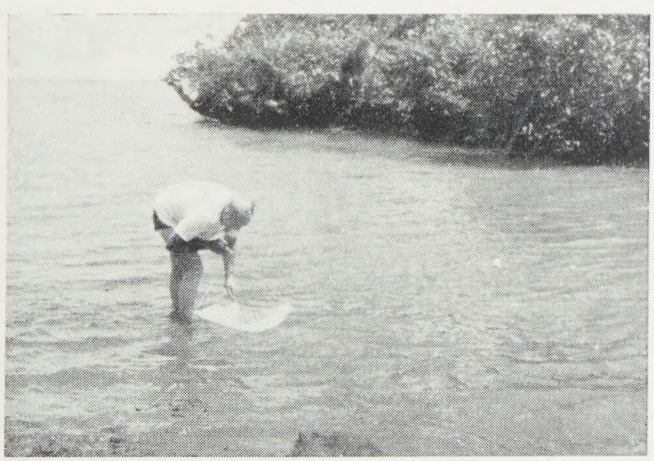
Fish canneries are few. One was previously operating in French Oceania but is now closed. Another in New Caledonia still produces some canned seafoods. The largest is operating in American Samoa, canning tuna brought in by Japanese fishing boats working under contract. This cannery also operates a fishmeal plant, using the waste and offal from tuna as raw material (fish meal is excellent as feed for poultry and pigs, and as a fertilizer).

Besides the fleet of Japanese boats working for the cannery in American Samoa, many fishing vessels from Japan operate in the South Pacific, sometimes in groups with a mother ship. Their fishing method is longlining, a technique requiring a great amount of energy, organization and capital, and therefore not immediately suitable for use by most Pacific islanders. It is, however, possible that a modified form of longlining would be practicable in places where bait is available.

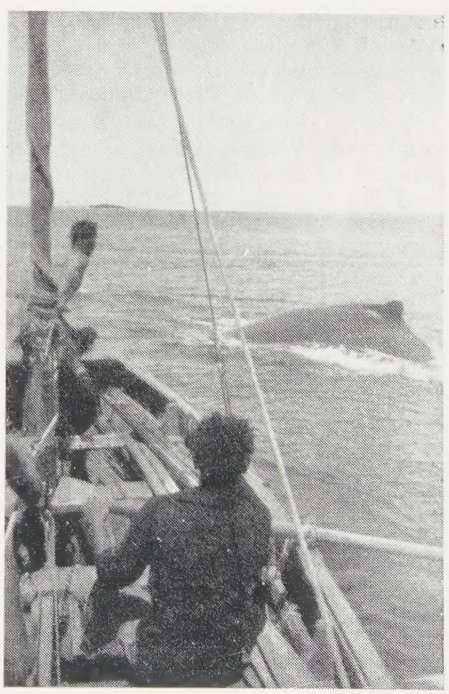
In the last few years the various governments responsible for the administration of territories in the South Pacific have shown increasing interest in the development of fisheries, as the following examples illustrate.

Surveys of sea fisheries resources and of fish preservation have been carried out in Papua and New Guinea. The local Fisheries Division is in charge of a specialist and a research vessel is to be ordered shortly. Inland waters and areas suitable for brackish water fishponds have also been investigated in Papua. (Information on future development plans appears elsewhere in this issue.)

2 See **Milk Fish Are Breeding in Lake Ano Ava,** "S.P.C. Quarterly Bulletin," vol. 5, no. 1, January, 1955.



Left: The author investigating a tidal creek in Western Samoa.



Right: Chasing a humpback whale off Tonga with open boat.

A fresh-water fish pond under construction in the Cook Islands. It will be stocked with Tilapia fingerlings supplied by the Fiji Department of Agriculture.

The French Institute of Oceania (Nouméa) is undertaking biological and physical research in oceanography in the region. A research vessel has been purchased and is being fitted out. A special survey of mother-of-pearl problems in French Oceania has led to a programme of rehabilitation of the oyster beds, which is now well under way. Fishponds have been designed by the author for the Department of Agriculture in New Caledonia.

There is a Fisheries Department in Netherlands New Guinea, where research work of practical interest is being carried out. This Department has research vessels (see *S.P.C. Quarterly Bulletin*, Vol. 4, No. 4, October, 1954). Inland waters are being studied by a team of specialists, and I have already carried out an investigation of the north and south coasts of New Guinea.

Besides investigating fish farming prospects in Western Samoa I have just returned from a survey of fisheries in the Cook Islands, with emphasis on the expansion of pearl oyster fisheries by improving the beds.

The United States has set up the Pacific Oceanic Fishery Investigation (P.O.F.I.) with headquarters in Hawaii, to study the occurrence, concentration and commercial value of various tuna species in the Pacific. Although based outside the Commission area, this organisation covers part of it, using several research vessels. Sponge species existing in the Marianas, Carolines and Marshalls are also under study. Following my visit to American Samoa, a request has been made for similar surveys to be carried out in Guam and the Trust Territory of the Pacific Islands.

There is particular interest in fishponds for Fiji. One experimental pond is already operating in Sigatoka and plans have been provided by the Commission for others. Various investigations have taken place in recent years, covering both sea fisheries and inland waters.

The Kingdom of Tonga also has a Fisheries Section and a research vessel, and the Commission is keeping in close contact with the activities of that service. A survey of fisheries in the Group has been carried out by me.

Enquiries concerning fisheries and related matters have come to the Commission from most governments in the area, and, during my field trips in the territories, both government officials and private persons extended the most generous assistance and co-operation.

There are still a number of territories in the South Pacific which I have not visited, and many problems of which I am not yet aware. From what I have already seen, however, there emerge a few points of immediate importance for the development of fisheries in the various territories.

First of all, wherever higher catches can be expected through the introduction of motor boats, small wooden craft with a simple engine will have the best chance. Shallow draught boats are advisable wherever the coast does not provide deep sheltered anchorages. The engines should be of a type for which spare parts are readily available. Average weather conditions in the locality, as well as the facilities available for engine repairs, should be taken into consideration.

Motor boats offer good possibilities for handlining, trolling and even longlining with a shortened type of longline, if bait is available.

Turbid waters generally provide good fishing with gillnets and even, if the bottom is clean, with small dragnets (in New Guinea for instance).

Pearl oysters and trochus for their shells, edible oysters and mussels for food, are equally worthy of attention. It should not be forgotten that we have these in the region and that it is probably possible to transplant them.

Fresh and brackish water fish can, under suitable conditions, provide considerable resources, whether they are raised in ponds or, after suitable investigation, used to stock natural ponds, lakes, swamps or streams.

Fish curing by various methods could be encouraged in many places both to extend local sales, or for export.

New or improved kinds of fishing gear, provided they are readily acceptable to local fishermen, could assist them in securing larger catches with less effort. The gear and methods most suitable for a particular locality or purpose will depend on many factors such as the condition of the water (clear or turbid, current, depth), the condition of the bottom (sand, mud, coral), the nature of the fishing (pelagic, bottom), and the time of fishing (day or night).

A lack of control over fisheries resources, or a lack of the specialised knowledge necessary for extension work, appears to be a serious handicap to the development of fisheries in many territories.

The South Pacific Commission is ready to help with advice and assistance on all these problems.

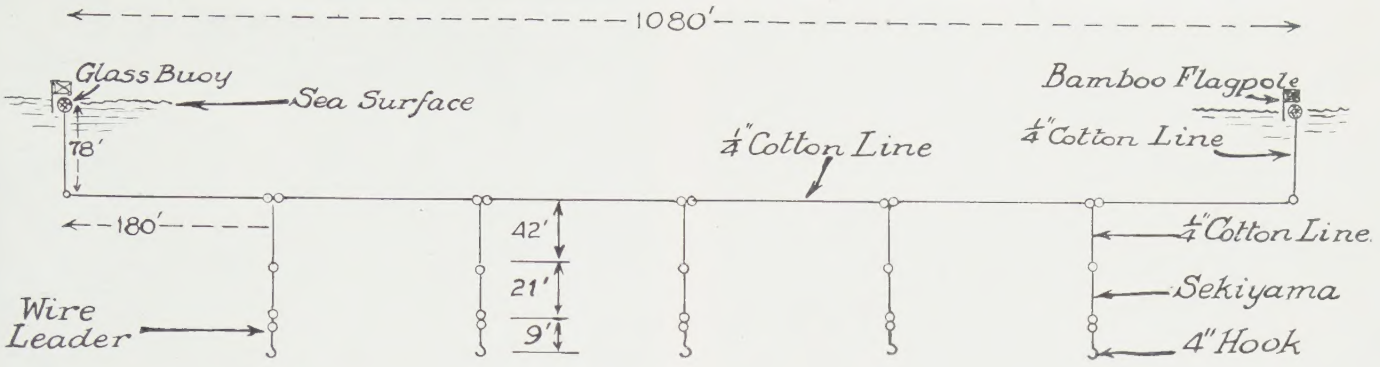
Major Rice-Growing Project for Netherlands New Guinea

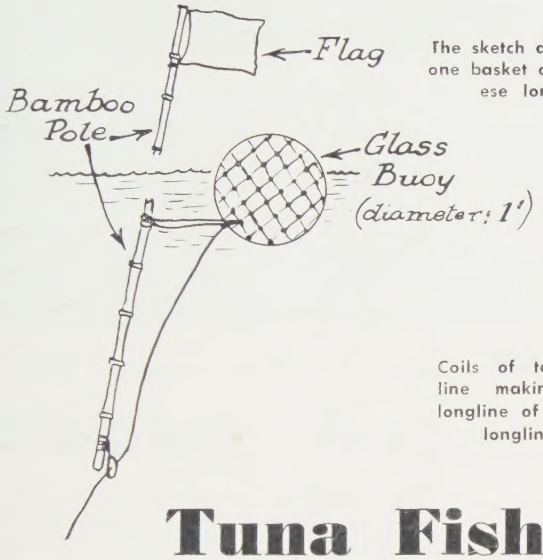
LARGE-SCALE mechanical cultivation of rice in an area near Merauke in Netherlands New Guinea is the aim of the Koembe project, which is intended to make the territory self-supporting in rice, now imported from Thailand. Cost of the project is estimated at £5,000,000.

Construction has begun of a road eight miles long, from the coast to the selected area. Recently a ship carrying 500 tons of agricultural tools, narrow gauge railway tracks and material, trucks, carriages, tractors, etc., was unloaded in the locality.

It is expected that the first rice crop will be harvested by the end of 1955 from a pilot area (a so-called "polder") of about 1,000 acres. It will be protected by low dykes against the water from the mountain streams in the north and high tides in the south.

In view of the existing labour shortage in New Guinea, mechanical cultivation has been decided upon. With the aid of films and slides, the local population is being trained to handle all machinery, such as tractors, railway engines and pumps.





The sketch above shows one basket of a Japanese longline.

Coils of tarred cotton line making up the longline of a Japanese longline boat.

Tuna Fishing With The Japanese Longline

Japanese fishermen use the longline method of catching tuna with outstanding success. Practical details are given below.

By H. VAN PEL

IN the deep seas of the South Pacific, tuna can be found in many places. Since these fish live mostly in clear waters, are fast swimmers, very shy, and do not readily bite on stationary lures, they are obviously rather difficult to catch.

So far, the best type of gear evolved for tuna fishing in this area is the longline. Most *Quarterly Bulletin* readers will have heard of Japanese tuna fishing activities in the South Pacific. These Japanese fishermen use the longline with outstanding success.

This type of gear can be rigged up in various ways, according to the dimensions of the boat, the depth at which the fish stay and at which they find their usual food.

In 1954, the Japanese fishermen delivering tuna to The Van Camp Cannery at Pago Pago, American Samoa, were using about 300 "baskets" of line in each boat, each basket consisting of a cotton mainline divided into six sections, each 30 fathoms[1] long as shown in the illustration. This mainline is set either horizontally or in bights, and is held up by 13-fathom cotton lines bent on to glass floats. A bamboo pole and flag is attached to each float as a marker. From each basket of mainline hang five branch lines, each 13 fathoms long and consisting of three parts, the last of which is a steel wire leader with a tuna hook.

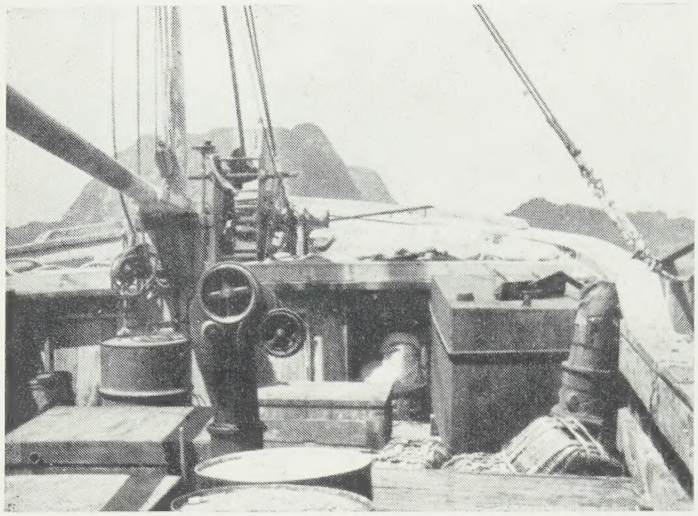
The 300 baskets of mainline can thus be set to cover a maximum distance of 54,000 fathoms, or 53 nautical miles. Needless to say, the hauling is done with the help of a "line hauler", a special type of winch. Including the branch lines, some 74 nautical miles, or 139 km., of line are required for such a longline spreading 1,500 hooks. Obviously, this type of gear is both expensive and bulky.

Saury, a kind of herring, was used for baiting the hooks. This bait had been brought from Japan. Other species can be used but in general bait should be fresh, as tuna is rather "choosy" with anything that does not move.

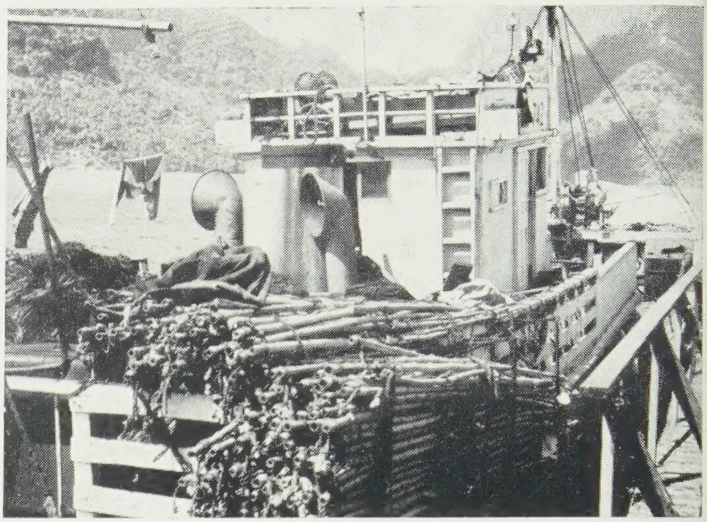
The boats were 150 to 160 tons gross, powered with 210 to 240 BHP diesel engines. Smaller vessels use shorter lines.

Setting and taking in the longline is a strenuous job, occupying from 23 to 28 men night and day, with a bare minimum of rest. Depending on the length of the line, setting may take 4-6 hours and hauling 10-12 hours. Between these operations, other work must be attended

1 One fathom equals 6 feet equals 1.83 metres.



Line-hauler, a special type of winch, on the foredeck.



Line and bamboo poles stowed on a Japanese longline boat.

to. This is repeated every day spent in the fishing area, the duration of each trip being inversely related to the success of the fishing.

Catches ranged from one to five tons a day. Various species of tuna were represented: yellowfin, albacore, bigeyed tuna and skipjack, among which albacore commands the best prices. In addition, the catch included sharks, marlin, sailfish, etc.

The South Pacific Commission will be pleased to supply further details, on request, to anyone interested in this type of fishing.

Research Council Holds Seventh Annual Meeting

LAST month eighteen specialists in education, agriculture and health from island territories throughout the Pacific assembled at Commission headquarters in Nouméa for the seventh annual meeting of the Research Council, which was held from 20th July-1st June.* Representatives of FAO, UNESCO, WHO, the Australian National University, and the Queensland Institute of Medical Research also attended. The Chairman was Mr. W. C. Groves, Director of Education in Papua and New Guinea.

The meeting was opened by Dr. Ralph Clairon Bedell, Secretary-General of the South Pacific Commission.

The Council reviewed the Commission's activities during the preceding twelve months, and made recommendations for its work programme for 1956.

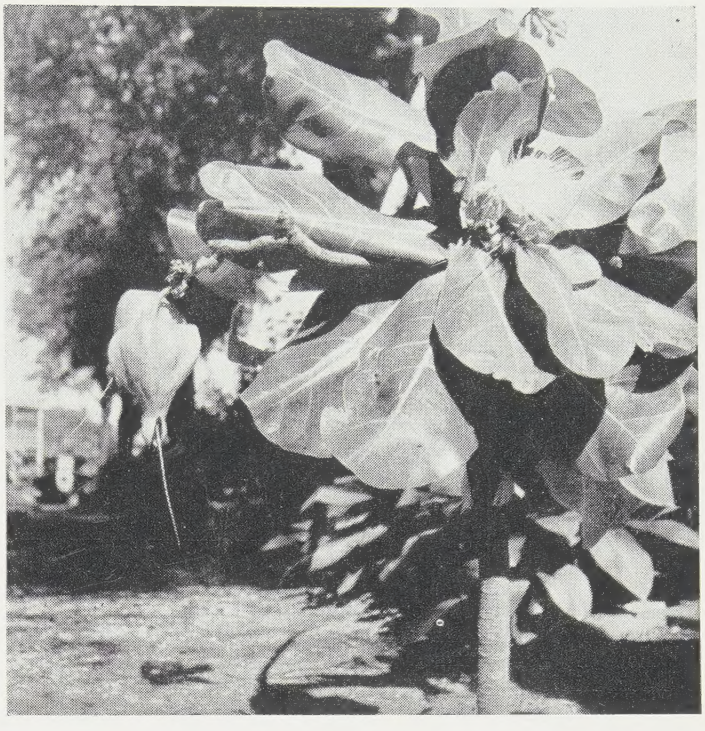
Topics discussed included the campaign against the rhinoceros beetle and other pests, improvement of fisheries, improvement of pastures and introduction of livestock, promotion of cooperative societies, provision of literature for island readers, atoll development, tropical school and dispensary design, and regional training of community leaders. Best methods of successfully pooling territorial technical services and skills were also discussed.

Recommendations made by the Research Council will be considered by the Commission at its Fourteenth Session, to be held in Nouméa next October.

* The Research Council is the Commission's expert advisory body. Its twenty-two specialist members comprise eighteen who are mainly technical officers from territorial administrations, and four permanent officers of the Commission.

Members of the Research Council for 1955, and principal officers of the Commission, photographed during the Council's seventh meeting held at Commission headquarters last month. Left to right: Dr. F. Bugnicourt, Mr. J. Ryan, Prof. E. L. Massal, Dr. L. G. Poole, Mr. J. E. Willoughby, Med. Ltd. Col. G. Boussier, Mr. G. K. Roth, Dr. H. Kroeskamp, Mr. W. N. A. Allison, Dr. J. E. Kennedy, Mr. D. R. A. Eden, Mr. B. E. V. Parham, Prof. O. H. K. Spate, Mr. W. C. Groves (Chairman), Mr. H. J. Coolidge, Dr. Ralph C. Bedell (Secretary-General), Dr. A. H. J. Kroon, Mr. H. M. Phillips, Mr. J. C. Cool, Dr. Cecil Miles, Mr. H. E. Maude, Dr. E. M. Ojala, Dr. T. C. Lonie, Dr. A. Perk.

The crushed kernels of this plant (Cerbera) are used to poison fish.



Barringtonia: another species whose toxic kernels provide a fish poison.

Fishing Poisons Of The South Pacific

At the First South Pacific Conference (April, 1950) the representatives of the island peoples expressed concern that in some parts of the South Pacific, fishing methods included the use of poisons and of explosives, and recorded the view that, wherever possible, these practices should be prohibited. The Commission endorsed this resolution and commended it to the attention of the governments concerned.

By JACQUES BARRAU*

AMONGST the many methods devised by South Pacific islanders for catching fish, the use of poison plants deserves mention. (Of course, these poisons can be effective only in ponds and streams or in the pools left at low tide on some reefs.) The method is practised almost everywhere in the islands, more particularly perhaps in the Western Pacific, although Polynesians also use, or used, it rather frequently.

Most of the naturalists who visited Polynesia in the course of the last century described a number of plants traditionally used for poisoning fish.

Moerenhout[1] mentioned the use of *Tephrosia, Cerbera* and *Barringtonia* in connection with fishing in the islands now known as French Oceania. These plants are found in most Polynesian islands, together with a few others such as *Diospyros samoensis,* whose fruits are used by Niue fishermen.

The number of fishing poisons is probably larger, and their employment more common, in the islands of the Western Pacific. Gatty[2] in the excellent study he recently made of this matter, mentions, in Fiji, *Pittosporum, Barringtonia, Tephrosia, Derris* and *Euphorbia.*

In New Caledonia, *Derris, Cerbera* and *Euphorbia* are commonly used, as well as *Excoecaria agallocha* and *Entada* sp., probably *gigas.* Virot[3], in his study of fishing poisons in this territory, was surprised to find that the natives did not use *Derris uliginosa,* a plant commonly found in the island. He was mistaken, as local fishermen of the east coast commonly use it.

Most of the above-mentioned plants grow wild. However, in Fiji, New Caledonia and the Loyalty Islands some *Euphorbia* are cultivated for fish poison. Thus, the species described from New Caledonia and the Loyalty Islands under the name *Euphorbia kanalensis* is only found in the cultivated state, propagated by cuttings, and can be observed in most gardens. Similarly, in New Guinea, some species of *Derris* are commonly cultivated in the gardens.

The toxic agent varies according to the plant used. In Leguminosae such as the various *Derris* and *Tephrosia* it seems that the active principle is a Methoxylactone (Rotenone in *Derris,* Tephrosin in *Tephrosia*). Among the Apocynaceae, the toxic effect might be produced by Glucosides (Cerberine of the *Cerbera*) as appears also to be the case for the Euphorbiaceae and *Excoecaria agallocha.* As for the *Barringtonia,* the toxicity of the kernel, which is the part used in fishing, seems to be due to the presence of a Saponine.

Vegetable fishing poisons are used in different ways. In some species, the roots are used (*Derris*); in others, the kernels (*Cerbera, Barringtonia*) or the stems and leaves (*Euphorbia*). In New Caledonia, the natives prepare bundles of leafy branches of *Euphorbia kanalensis,* first pounding them roughly, and throw them in the pool to be poisoned. In rivers, these bundles are sometimes

1 Moerenhout, **Voyages aux Iles du Grand Ocean.** Paris, 1837.

2 Gatty, **Use of Fish Poison Plants in the Pacific.** Proceedings of the Fiji Society of Science and Industry. Suva, 1943.

3 Virot, **Les plantes ichtyotoxiques de la Nouvelle Caledonie.** Revue Internationale de Botanique appliquee et d'Agriculture tropicale— No. 327-328. Paris, 1950.

* Mr. Barrau is Subsistence Agriculture Officer to the South Pacific Commission.

Derris growing in a coastal village in the Morobe District, Netherlands New Guinea. Poison diffused from crushed roots of this plant thrown into water stuns fish, which can then be easily collected.

placed upstream of some rough contraptions of rocks and branches, against which the fish, stunned by the poison diffused in running water, are collected.

The poison plants are sometimes cooked before use (*Pittosporum, Entada*), while the toxic kernels of *Barringtonia* and *Cerbera* are crushed or grated before throwing them in the water.

* * *

The use of fishing poisons is now prohibited in many South Pacific territories. Sometimes, in view of the moderate use made of them by the natives, administrations have felt it was preferable not to ban these traditional techniques; this is the case in Papua and New Guinea, and in the British Solomon Islands.

It should indeed be acknowledged that, in most cases, the islanders knew enough to exercise moderation in the use of fishing poisons. When these were used strictly in the context of a subsistence economy, it is highly probable that the practice of this fishing technique never represented a serious threat to the resources of streams and reefs.

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The Productivity Of Fish Ponds

THERE has been in recent years a growing interest in the establishment of fish ponds in tropical Asia and Africa. In the South Pacific also there is already some interest in the possibilities of fish farming in ponds.

In many places where sea fish are not available—or available during part of the year only—the fish pond could provide an excellent addition of high-value protein food to the diet.

A remarkable feature of fish farming is its high productivity per acre. Although the expression of 'fish production per acre' is a normal practice, it is not quite correct as fish are not reared on a surface but in a certain volume of water.

One can stock more fish in a pond of a depth of 3 ft. than in a pond of 6 ins. For best results a depth of around 3 ft. seems desirable.

In Africa production rates of up to 5,000 kg./ha. (4,500 lb./acre) have been obtained from farming *Tilapia* species in fish ponds under very favourable conditions. While this may be regarded as an unusually high maximum, yields of up to 4,000 kg./ha. (3,500 lb./acre) have been recorded in various tropical countries. This is eight times as much as the maximum yield in Western Europe, where 500 kg./ha. (450 lb./acre) can be obtained only with carp in fish ponds under the best conditions.

It might be of interest to compare these figures with the production figures of another source of animal protein—the productivity of beef cattle.

In Western Europe the productivity of beef cattle is of the same order as the productivity of fish. Productions of 500 kg./ha. (450 lb./acre) dressed beef can be obtained under excellent conditions. However, in a hot, humid tropical climate beef production is very much lower. Some authorities give a figure of 50 kg./ha. (45 lb./acre) as being good.

Whereas long-term basic research will be necessary to solve the problems in grassland and cattle improvement in the tropics, fish culture in ponds can be introduced immediately with fair chances of good results.

Preservation of Fish

Letter To The Editor

The following passage concerning the preservation of fish is taken from a letter recently received from Monsieur Jacques de Préville, of Vila, New Hebrides:

"In the last *Quarterly Bulletin* I received (January) I read with interest your article on fish preservation. It reminds me of a discovery I made quite by chance. After a miraculous catch of large mullet I distributed fish enough for two days to my employees and salted the remainder, intending to put it out to dry in the sun.

"After two days the rain began to fall and seemed likely to continue for some time; I therefore had the fish hung up under the roof of the copra 'smoke' which was operating permanently at the time and left it there just as it was. After a fortnight or a month I decided to taste it and was surprised to find that it had a smoked flavour as good as, if not better than, that of good quality cod found on the market.

"There could be no simpler method of processing fish for many planters, to whom this might be of interest."

Papua and New Guinea Medical Journal

"*The Papua and New Guinea Medical Journal* has been established as an instrument of the Department of Public Health of the Territory of Papua and New Guinea and is to be published quarterly," writes Dr. J. T. Gunther, Director, Department of Public Health, Territory of Papua and New Guinea, in the foreword to the first issue (dated May, 1955). "Results of research carried out by medical personnel into the particular problems of the Territory have been published outside the Territory, and advances in the prevention and treatment of local diseases have been spread by these external journals and departmental circulars."

"The *Journal*," says Dr. Gunther, "is intended to keep our varied grades of medical personnel abreast of world progress in the prevention and treatment of the disease pattern of the Territory, to promote medical research locally into these diseases and to facilitate an exchange of ideas between officers who are otherwise geographically isolated."

The *Quarterly Bulletin* welcomes this new periodical in the Pacific and wishes it every success.

(All communications should be addressed to the Editor, *Papua and New Guinea Medical Journal*, Department of Public Health, Port Moresby, Papua and New Guinea.—Editor.)

Above: The urban house. The only structural innovation is the design of the windows and doors. Right: The rural house is built of only three materials—timber, clay, and bamboo.

Two Low-cost Tropical House Designs

Particulars of low-cost urban and rural tropical houses designed in the Department of Architecture of the Bengal Engineering College and exhibited last year at the International Exhibition of Low-cost Housing at New Delhi have been received by the Commission, and may be obtained on request.

The urban house is constructed of ordinary materials (brick walls, cement asbestos roofing, a simple wooden frame) used in a standard way. As illustrated, the house is semi-detached and contains:

two sleeping rooms (each 9′ x 15½′);
large private verandah (26′ x 50′) enclosed by a walled court;
smaller verandah (6′ x 11′) opening onto the street;
kitchen (7′ x 7′); and
shower and privy.

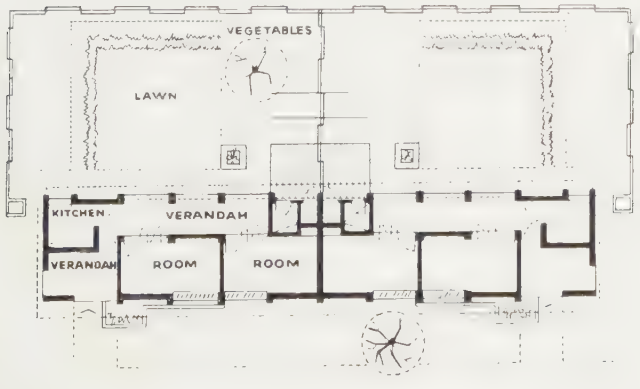
Plinth area is 700 square feet. Estimated cost at Calcutta Rs. 3300-3500 (£stg.248-268), including electrical and sanitary fittings.

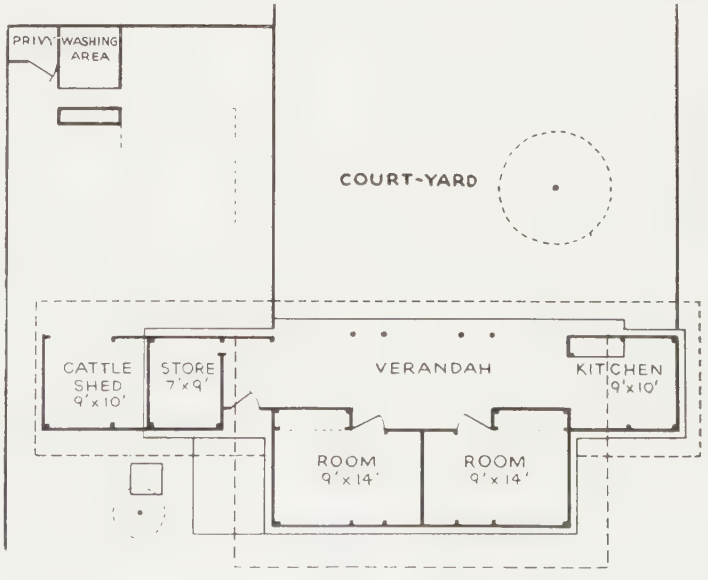
The rural house is built entirely of three materials; wood for the roof framing; earth (clay) and bamboo. If necessary, bamboo can be substituted for the wood. It is designed essentially for construction by village labour, and the only material which would normally require to be purchased is creosote (or some similar preservative).

Area is 900 square feet. Local cost in West Bengal, Rs.1200-1500 (£stg.90-113).

Although primarily intended for Indian conditions, it is considered that both designs could be adapted to meet housing needs in parts of the Pacific region. Costs in the islands would undoubtedly be much higher than those ruling in India, but, even so, should compare favourably with other designs and types of construction. The rural home appears particularly suitable for use in connexion with aided self-help housing programmes, with necessary changes, both in design, to meet local social and economic conditions, and in construction, to utilize local materials.

Plans of urban house (below) and rural house (right).





Ipomoea Batatas **Lam.**

Pacific Subsistence Crops . . .

SWEET POTATO

The sixth of a series of articles on subsistence food plants in the South Pacific

BY EMILE MASSAL and JACQUES BARRAU

Executive Officer for Health , **Subsistence Agriculture Officer**
South Pacific Commission

THE sweet potato, known botanically as *Ipomoea Batatas,* Lam., belongs to the family of Convolvulaceae. Although it is grown today in almost all South Pacific islands, its importance in the diet of their inhabitants varies considerably from one territory to another. The sweet potato is of great interest as a crop of high food value which is easily grown and matures quickly.

It is an herbaceous plant, with a smooth surface and long trailing stems containing a characteristic milky juice. The flowers are funnel-shaped, varying in colour from light to deep pink; the leaves are either entire or lobed; the tuberous roots, which are fusiform in shape, are regularly used for human consumption. The skin of the tuber ranges in colour from light yellow to dark purple, and the flesh may be white, pink or one of a number of shades of yellow.

Today the sweet potato is widespread in native gardens in the Pacific islands, but there has been lively controversy on how it reached them. The plant is nowadays generally considered to be of American origin, for it is closely related to various plants occurring naturally in the West Indies and Central America. Nowhere, however, has the sweet potato been encountered in the wild state; genetic studies have proved that it is the result of natural cross-breeding.

The sweet potato was grown in tropical America before the discovery of the New World by the Spanish. As early as 1495 they brought seedlings to Europe, then to India, the Philippines, China and Japan. The Herbarium Amboinense of Rumphius shows that, by 1650, it had reached the western limits of Melanesia.

When they discovered the islands of Polynesia, Europeans recognised the sweet potato growing there. The various names given to it, "Kumara", "Umara", "Uara", "Umala", "Kumala", were very close to the native names used in Peru, Colombia and Ecuador. It had been introduced by the islanders, but anthropologists disagree over the responsibility for this introduction. Some, including the late Sir Peter Buck, claim that the Polynesians at some time visited the western coast of America and brought the plant back with them. Others, such as Thor Heyerdahl, believe that American Indians migrated to the Pacific islands, and brought the sweet potato with them.

The sweet potato spread throughout the Polynesian world, reaching Hawaii in the north and New Zealand in the south, becoming the staple food of the Maoris. Carried by man, it made its way westwards, reaching the eastern limits of Melanesia before the arrival of the Europeans. Labillardière, the naturalist in the expedition which set out from France in search of La Pérouse, recorded its presence, in 1792, in the gardens of northern New Caledonia.

However, the presence of sweet potato in the isolated valleys of the central New Guinea highlands, where it was, and still is, the basic subsistence crop, has yet to be explained. Our present knowledge of the question being still far from complete, the most plausible theory is that it was introduced comparatively recently via Indonesia, which received the sweet potato from the Spaniards or the Portuguese.

Although the American origin of the sweet potato is today universally accepted, Professor Merrill[1] has recently advanced a daring hypothesis suggesting that *Ipomoea Batatas* is a hybrid resulting from natural cross-breeding in Africa. It would then appear to have travelled with man to America before the time of Columbus, either by crossing the Atlantic, or the Pacific via Madagascar, Papua and Polynesia. No convincing proof, however, has yet been advanced in support of this new theory.

Cultivation Methods

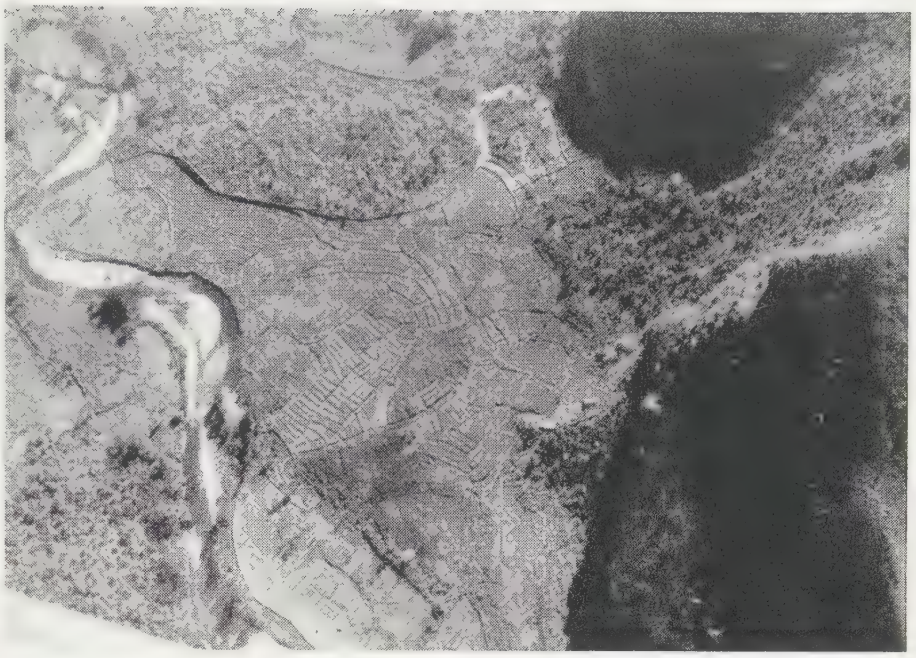
In the native gardens of the South Pacific, the sweet potato is generally propagated from stem cuttings; tubers are less often planted.

Light, well-drained soils are best suited to its cultivation, but other types of soil with good artificial drainage may be used. The highlanders of New Guinea, for instance, grow the sweet potato with composting and drainage; such highly-developed techniques have profoundly altered the agricultural landscape of the highland valleys. Sweet potato is usually planted in mounds of loose earth which allow full development of the tubers. According to variety, harvesting takes place from 3 to 7 months after planting. In certain highland areas, with a relatively damp, cold climate, the growth period is longer.

The average conditions prevailing in native gardens produce a yield ranging from 3 to 6 tons per acre, representing from 3 to 6 million calories. In (Australian) New Guinea, a variety of Japanese origin, known as "Okinawa", can give up to 8 tons per acre.

The sweet potato can be preserved, provided it is free of damage and is kept

1 cf. E. D. Merrill, **The Botany of Cook's Voyages,** Chronica Botanica, Vol. 14, No. 5/6, 1954.



Aerial view of the sweet potato gardens in the Baliem River valley, central Netherlands New Guinea. Note elaborate drainage.

in a dark, cool and airy spot. Excellent results can be obtained by placing the tubers in thoroughly dry ashes. In the New Guinea Highlands, sweet potato tubers would probably keep better if left to dry out in the sun for several days before storing.

A Valuable Food

In the South Pacific, the sweet potato is the staple food of New Guinea highlanders; it played the same part among the Maoris in New Zealand. In territories with marked seasonal variations in agricultural production it is a useful stand-by crop; in New Caledonia, for instance, it is customary, during the yam harvest, to make staggered plantings of sweet potato in order to supplement the diet when the yam stocks are exhausted. Early varieties are very popular for this purpose.

The sweet potato has proved quite providential on occasion when the subsistence economy of a territory has been upset by the failure of the traditional staple food. For instance, in the gardens and diet of the inhabitants of the Western Solomons, sweet potato has taken the place of the taros destroyed by the *Phytophthora*.

Although very widespread in Pacific territories, the sweet potato has in the past been no more than a supplementary food. Nowadays its cultivation is becoming increasingly important in native agricultural systems, for its yield, rapid production, and the fact that it is easy to grow, allow the native agriculturist to devote a large part of his time to the other activities of present-day life. Early varieties with a high yield are being grown more and more often. Varieties of American origin such as "Nancy Hall" or "Porto-Rico", introduced in 1945, notably by Michael Leahy in the Zenag district, are found in a number of native gardens in New Guinea.

The root tubers are generally used for human consumption or, less often, the tips of the young shoots.

The composition of tubers varies greatly with the variety, at least as far as certain nutrients are concerned; and, even within the same variety, according to methods of cultivation, the time of harvesting, and the duration and conditions of storing. However, the following average values per 100 gr. (approximately 3½ ozs.) of raw, edible material may be considered reliable in practice:

water	70.8 gm.
calories	100
proteins	1.7 gm.
fat	0.3 gm.
starch	25 ,,
reducing sugars	3.5 ,,
cellulose	0.8 ,,
pectic substances	2.5 ,,
ash	1 ,,
calcium	35 mgm.
phosphorus	50 ,,
iron	0.8 ,,
vitamin A	2,500 I.U. (in beta carotene)[2]
thiamin	0.10 mgm.
riboflavin	0.05 ,,
niacin	0.7 ,,
ascorbic acid	25 ,,

Food Value of Sweet Potato

Extensive work has been devoted to the study of the food composition and value of the sweet potato. Certain varieties, cultivated for the industrial extraction of starch, contain almost 5 ozs. per pound. The proteins are considered to be of high quality. Their biological value has been established at 74, which is a fairly high grade. Certain of the so-called "essential" amino-acids are present in satisfactory proportion. Ipomein, the main protein, contains about twice as much sulphur as does tuberin, found in the potato.

The potassium content is high, 58.2% (expressed as K_2O) of the total ash. Calcium, 5.6% (as CaO), magnesium, phosphorus, 16.2% (as P_2O_5), and sodium 8.1% (as Na_2O) are also present in fairly high quantity. The contents of copper, magnesium, zinc, iodine and fluorine are low, but nevertheless of nutritional importance.

Particular study has been devoted to the pro-vitamin A content of varieties with coloured flesh. The greater part of the pigments is made up of beta-carotene which varies in quantity, according to the variety of sweet potato, from 13.7 to 34.8 mgm. per hundred grammes dry weight. Here is a comparison of the vitamin A content of certain yellow vegetables expressed in international units per 100 grammes of raw, edible material.

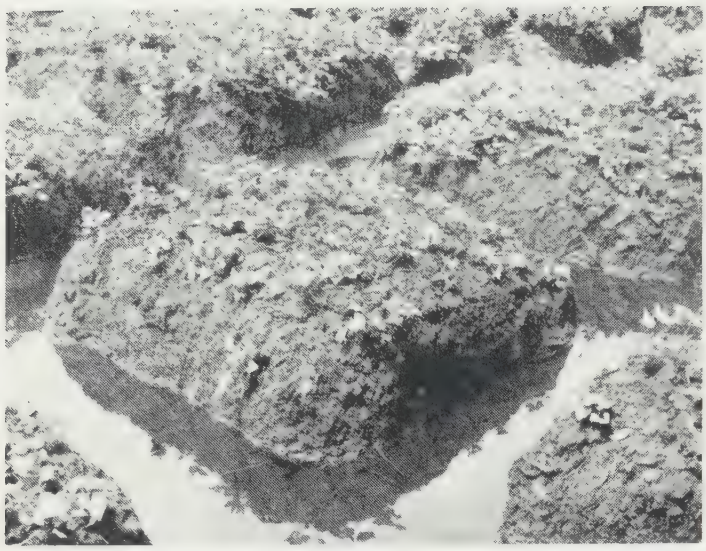
Sweet potato (average yellow-fleshed variety)	5,000
Potato	40
Carrot	14,500
Pumpkin	1,200

It is generally agreed that the daily ration for an adult should consist of 14,000 I.U. of vitamin A in the form of beta-carotene: 300 gms. of yellow-fleshed sweet potato would thus cover this need. Such sweet potatoes with yellow-fleshed tubers are commonly grown in the Polynesian islands of the Eastern Pacific. On the contrary, in Melanesia, and particularly in the Highlands of New Guinea, the traditionally-grown varieties are mostly white-fleshed and their content of vitamin A is very low.

To sum up, the sweet potato can be considered as a valuable energy food, giving sufficient quantities of mineral salts and vitamins, vitamin A being especially prominent in varieties with coloured flesh.

The composition of the young shoots is given here, without comment. In 100 grammes of raw, edible material, the following are present:

2 According to the varieties, the vitamin A content is very variable. It may be higher than 5,000 I.U. for some varieties with yellow-fleshed tubers and lower than 2,000 I.U. for white-fleshed varieties.



Sweet potato growing in the marshland area surrounding the Wissel Lakes, central Netherlands New Guinea, altitude 6,000 feet.

Sweet potato growing on a platform covered with mud in the marshland area of the Waropen, Netherlands New Guinea.

water	85	gm.
calories	48	
protein	3.6	gm.
fat	0.7	,,
carbohydrates	9.2	,,
fibre	1.5	,,
ash	1.5	,,
calcium	75	mgm.
phosphorus	70	,,
iron	8	,,
vitamin A	6,000	I.U.
thiamin	0.12	mgm.
riboflavin	0.24	,,
niacin	0.90	,,
ascorbic acid	27	,,

Native methods of preparing and cooking sweet potato present very little variety. The tubers are mostly baked or braised in the native oven, before being peeled, or else they are boiled after peeling. They are then eaten as they are, or rarely, mashed with coconut milk.

Composite dishes are sometimes prepared. The potatoes are peeled, sliced and mixed with other tubers prepared in the same way, and occasionally with various types of green leaves. The mixture is moistened with coconut milk, wrapped in a banana leaf and braised in the native oven. Sometimes pork or chicken is added.

Europeans readily make use of the sweet potato. They find it has a pleasant flavour and can usually be successfully combined with other foodstuffs. A number of recipes has been suggested, most of them for yellow-fleshed varieties. Here is a selection of them:

SWEET POTATOES IN SYRUP

4 *large sweet potatoes*
1 *cup of brown sugar*
pinch of salt
½ *cup of butter*
¼ *cup of hot water*

Parboil the sweet potatoes, peel them and cut them lengthwise into four. Place them in a greased baking dish. Make a syrup with the sugar, butter, water and salt and pour it over the sweet potatoes. Cook in a moderate oven until the sweet potatoes are golden brown, moistening them frequently with the syrup. If necessary add a small quantity of boiling water. Before serving sprinkle with chopped nuts.

SWEET POTATO CROQUETTES

2 *cups of mashed sweet potatoes*
1 *egg yolk*
1 *teaspoon of chopped parsley*
1 *egg*
2 *dessertspoons of butter*
salt and paprika pepper
½ *teaspoon onion juice*
bread crumbs

Mix the mashed sweet potato with the butter, egg yolk, parsley, salt, pepper and onion juice. Form the mixture into round or pyramid-shaped croquettes. Dip them into the beaten egg, roll in bread crumbs and fry golden-brown in very hot fat. Drain and garnish with nuts.

SWEET POTATO WITH HAM

1 *piece of smoked ham, sliced*
3 *cups of raw, sliced sweet potato*
1 *tablespoon of butter or ham fat*
1 *cup of hot water*
sugar

Brown the ham lightly on both sides. Arrange it to cover the bottom of a baking dish. Spread the slices of sweet potato over it. Sprinkle with sugar. Add the hot water and butter (or fat), cover the dish and bake slowly until the ham is tender. Baste the potatoes, occasionally, with the gravy. Brown the top well.

SWEET POTATO FRITTERS

4 *boiled sweet potatoes*
1 *cup of milk*
castor sugar; lemon juice

Cut the boiled potatoes into thin slices and let them soak in the milk for ½ hour. Make a light, sweet batter with egg, milk, sugar and flour. Before removing the potatoes from the milk, add the juice of one lemon. Lift each slice with a spoon, dip in the batter and drop into hot fat. When the fritters are well browned, place them on brown paper and sprinkle with castor sugar. Serve hot.

SWEET POTATO "TOURNEDOS"

Select sweet potatoes about two inches in diameter. Cook them in boiling water. Remove the skin and cut into pieces about two inches long. Wrap each piece in a thin slice of fat bacon and skewer with a tooth pick. Place in a dish and leave in a hot oven until the bacon is crisp. Serve garnished with parsley.

SWEET POTATO CAKE

3 *cups of mashed sweet potato*
½ *cup of butter*
2 *eggs*
¾ *of a cup of sugar*
juice of half a lemon
teaspoon of nutmeg or cinnamon
1½ *cups of flour*
2 *teaspoons of baking powder*
1 *teaspoon of salt*
½ *cup of milk*

Mix the butter and the beaten eggs with the mashed potato while still warm; add the sugar, salt and nutmeg or cinnamon. Sift the flour and baking powder together and add to the mixture, alternately with the milk. Add the lemon juice. Pour into a greased mould and cook in a moderate oven.

In the New Hebrides, small sweet potatoes with yellow flesh are sometimes prepared in the same way as glacé chestnuts. The resemblance is striking both in appearance and taste.

Extensive Selection Studies

In several countries, particularly in the

United States, Hawaii and Porto Rico, selection of sweet potato varieties is being studied extensively. Varieties with a higher yield and food value have already been produced. Amongst these may be mentioned "Onolena", obtained by the agricultural experimental station at Hawaii University from crossing "Porto-Rico" and "Nancy Hall". The tubers of these high-yielding varieties have the advantage of storing well. In the United States, "Early Port", produced by the Louisiana experimental station, gives a far higher yield than that of common varieties. "Gold Rush", also from the same station, has a carotene content almost twice as high as that of "Unit 1 Porto-Rico", so far considered as one of the richest. Similar work in improving yellow-fleshed varieties is being carried out at Porto Rico University.

Here mention can only be made of these few examples. Many new varieties would be worth introducing and trying out in South Pacific territories. With this aim in view, the Commission has established contact with the most important centres engaged in improving the sweet potato.

Netherlands New Guinea highlanders roasting sweet potatoes in the embers, Wissel Lakes area.

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Husking coconuts on Ebon Atoll, Marshall Islands.

THE MANUFACTURE OF COPRA IN THE PACIFIC ISLANDS

Methods of copra-making in general use in the Pacific are reviewed in a report with the above title, just published by the South Pacific Commission in its Technical Paper series (No. 82).

The author is Mr. W. V. D. Pieris, formerly Deputy Director of the Coconut Research Institute of Ceylon, and a leading authority on the coconut. In 1952 he was engaged by the Commission to make a two-year coconut and copra survey of the Pacific. This involved the study of existing plantings, the investigation of coconut varieties, cultural practices, mechanization, processing of copra, and transport and marketing procedures.

*During his survey Mr. Pieris visited all the main copra-producing territories of the region. His observations and findings in respect of copra manufacture are contained in the report just published.**

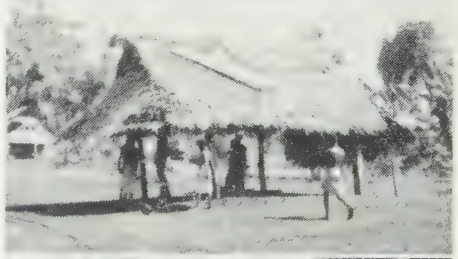
Methods of copra production Mr. Pieris studied ranged from simple sun- and smoke-drying techniques to hot-air drying in large kilns capable of producing two tons of copra daily. Among the many copra driers the author describes is the Ceylon standard copra kiln, in which the bulk of the quarter-million tons of high-quality copra produced annually in that island is made. Also described is a small hot-air drier of simple design used in the Seychelles to produce some of the world's finest copra. Mr. Pieris considers this a drier worthy of trial by Pacific smallholders.

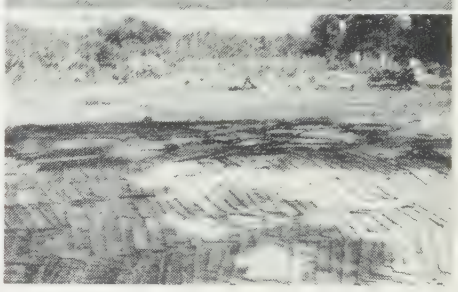
The report concludes with the author's recommendations, which, bearing as they do on an industry that produces 40% of the export wealth of the region, are certain to arouse widespread interest among planters.

THE MANUFACTURE OF COPRA IN THE PACIFIC ISLANDS *is lavishly illustrated with 65 photographs (most of which were taken by the author) and 11 diagrams. Copies are obtainable from the South Pacific Commission, G.P.O. Box 5254, Sydney, Australia; price 6/- stg., post-free by surface.*

* A detailed review of Mr. Pieris's report will appear in the October *Quarterly Bulletin*.—Editor.

Top: One of the buildings in the course of construction. Centre: Demolition of an old building on the school site. All old buildings were removed to ensure proper layout of the new school and surrounding grounds. Bottom: Morata (native roofing material) set out to dry. The students were also shown how to make bamboo blinds for the school buildings.





The Story Of Talidig School

By K. VELLACOTT-JONES*

TALIDIG is the centre of a group of villages about thirty miles from Madang on the north coast of Australian New Guinea. Some two years ago the Talidig people decided they wanted a school in their area, and agreed among themselves that they would provide the land and building materials, and erect the school with local volunteer labour.

They sought the assistance of the Education Officer of the Madang District, Mr. Thomas L. Stanley, in the design of the school buildings, and the way in which they should be built.

Mr. Stanley immediately visited the Talidig area, and with the leaders of the community it was decided that the work of building the school should take the form of a rural community development project in which there would be much parent participation.

Meanwhile, the Department of District Services and Native Affairs, through the Madang District Commissioner, promised to assist in any way possible, and the Department of Public Health collaborated by appointing a Native Medical Assistant to Talidig to look after the health of parents and children.

However, it was not possible to proceed with the permanent school buildings immediately, since Mr. Stanley's other responsibilities as Area Education Officer were particularly heavy at that time. It was therefore agreed that the villagers should erect temporary buildings until he would be able to spend some time at Talidig. This was done, and the school was opened in November 1953.

Supervising the erection of schools is not one of the many duties of an Area Education Officer, but this had not deterred him from carrying through a big rebuilding programme very much on a community effort basis to provide an entirely new group of buildings for the Madang Central School for boys of the district.

The Talidig project was much smaller, and limited to a smaller population, but Mr. Stanley intended that it should be a demonstration of community enterprise with the following aims:

1. To give instruction in carpentry, including the best use of the axe, saw, hammer and chisel in building activities.
2. To try to stimulate a desire in the local people for better and more hygienic homes than their old-style village houses.
3. To demonstrate that building could be carried on simultaneously with the routine gardening which is essential to village food production
4. To demonstrate improved agricultural methods and diversification of crops through the addition of rice and peanuts in village gardens; also to promote variety in the native diet, and encourage the practice of crop rotation.
5. To encourage women to take a more active part in community matters.
6. By establishment of a school built by community effort to encourage its use as a central point for other undertakings designed to assist the people in their everyday life.

Work on the permanent school buildings began in December 1954, when Mr. Stanley spent the Christmas and New Year school vacation at Talidig to get the project well started.

He set up his camp in the village on the 15th and immediately called a conference of the leading men of the communities concerned to plan the work. One of them had already given 50 acres of land for the school, located on a river which provided a permanent water supply. This acreage ensured that the school would have ample land for gardens to be cultivated for the dual purpose of providing practical lessons in improved agriculture and raising part of the food requirements of the new residential school.

Work Begins On The Project

Actual work started at six o'clock the next morning with teams of men from the various villages. The volunteers included students from the old school. The aim was not to build the school in a minimum of time but to use every phase of the work for demonstration and training purposes. This began with division of labour to assigned tasks, to make maximum use of the people engaged on the project. One group of men started clearing a portion of the site, others dug postholes for the uprights, another prepared the bush timber, and 48 schoolboys planted taro in an area already prepared for the school gardens.

Part of the frame of the first building was already erected by nightfall, and in the evening there was a meeting of all the village people. At this conference Mr. Stanley again outlined all the work which would be involved, and reiterated his hope that the people would make the school, and the wider uses he envisaged for it, a key factor in their lives and in village development. The villagers were unanimous in supporting this view and assured Mr. Stanley that they realised the extent of the work they had undertaken, and their willingness to carry it through.

Then came the surprise of the evening when a woman stepped forward and presented a letter written in Pidgin in which she said she wanted the children to be educated, and was not only prepared to help make the school gardens but would organize the other women for this work. This unusual participation by a woman in a village conference was welcomed by the men, and their spokesman, the *luluai*, or headman, gave public approval of this move and expressed

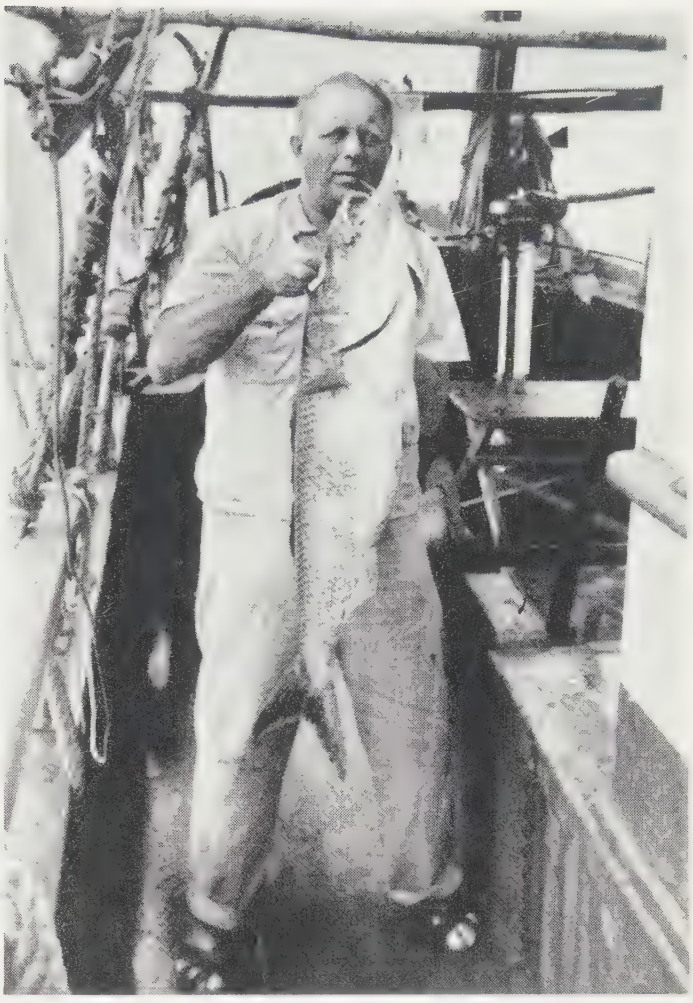
(Continued on Page 26)

* Miss Vellacott-Jones is Public Relations Officer, Administration of Papua and New Guinea.

Depth Trolling Off Tonga

Encouraging results from depth trolling trials in Tongan waters are reported below by the Fisheries Officer to the South Pacific Commission.

By H. VAN PEL

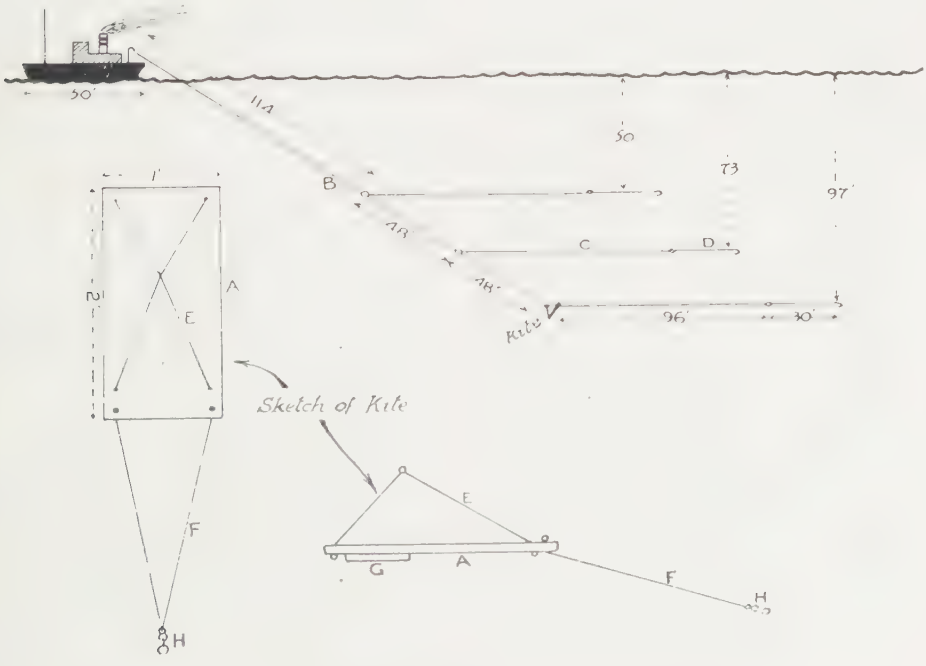


The author displays one of the fish caught during the depth trolling trials.

UNTIL recently it had long been assumed that the deep parts of the oceans were poor in fish. Now, however, different views are beginning to prevail. Indications to the contrary have indeed been given by the Kon-Tiki expedition, the various "bathyscaphe" explorations, the observations of Japanese longline fishermen and the work of Pacific Oceanic Fishery Investigations, to name only a very few.

The oceanic depths are not as poor in fish as one might think, but they are deeper and therefore more difficult to catch than in shallower regions. The transparency of the water away from the shores may also be a hindering factor. There are still many things in the depths of which we know nothing, especially from the commercial fishing angle. For these reasons I do not wish to commit myself on the subject, beyond saying that in my opinion there must be great quantities of fish deep down along the Equator. This much I can substantiate from my experience of various methods of line fishing.

In the South Pacific there is practically only one method applicable to large-scale fishing: the longline. However, its application is very difficult. It requires extremely hard work; it necessitates the use of fresh bait with the attendant difficulties of supply; while finally, the gear itself is expensive. These are the reasons I have been looking for something simpler. I felt it should be possible to troll deep down under the surface.



Depth Trolling Experiment

During an investigatory visit to the Kingdom of Tonga I had the opportunity to prepare some depth trolling equipment in collaboration with Mr. Mackenzie, the Fisheries Officer. We made a paravane and a depth kite to take our trolling line down. Both gave good fishing, although the best results were obtained with the kite, which went deeper (see sketch). The angle made by the line with the water surface was 30° for the kite, and only 20° for the paravane

The mainline (B) was of ¼-inch steel wire, 222 feet long. Of the total length, 210 feet were paid out, only 12 feet remaining in the boat during fishing operations. The mainline was cut 114 feet from the boat and a swivel inserted. The same operation was repeated 48 feet further on, and at the end of the

last 48-foot section, the line was attached to the depth kite (A).

The wooden depth kite was 2 feet long, 1 foot wide and ¾-inch thick. It was fitted with bridles (E) and a strap (F) made of ¼-inch cotton line. The intersection of the right and left bridles was on a perpendicular to the long axis of the kite, one third of its length from the lower end. A 4 lb. lead plate (G) was attached to the lower end in order to stabilize the kite.

A trolling line, which also served as a "tail" for the depth kite, was connected to a swivel (H) on the strap. At various times lines were also attached to the two swivels on the mainline. These lines were all 126 feet long, of which 96 feet were ¼-inch cotton line (C), followed by a swivel and 30 feet of ⅛-inch wire (D) equipped with a large fish-hook.

The paravane (not illustrated) was made of a 3-inch steel tube, 3 feet long, and equipped with a keel. I will not give a full description of it here, as results were not as good with it as with the kite (though it gave better fishing than the surface lines).

The kite exerted a 150 lb. drag; the paravane a 60 lb. drag. Trolling was undertaken in depths of 2,000, 1,000, 300, 200 and 50 fathoms. The fishery research boat of the Kingdom of Tonga was used.

No difficulty was experienced in making turns while trolling; a 180° turn could be effected in five minutes.

During actual fishing experiments, we were trolling one depthline with the kite and, in addition, five surface lines. The ratio of catches was 3 to 1; in other words, *one depth line* was catching as much as *15 surface lines* would have.

We also tried putting branch lines on the mainline swivels with good results.

Fresh mullet 10 inches long were used for bait on the first day. Salted mullet were used the second day, with equally good results. Having finished our supply of mullet bait, we then used belly strips from tuna, which also proved excellent. I feel that bait does not need to be as carefully chosen for depth as for surface trolling.

Optimum Trolling Speed

Trial runs were made at speeds of 4, 5, 6 and 7 knots. The optimum speed proved to be 6 knots. At 4 knots, few fish were caught. At 5 knots, the catches were improving, but sharks had a chance to take the fish off the hook. At 6 knots very good results were obtained, and the sharks did not cause any trouble. At 7 knots fewer catches were made, but the results were still good. These observations apply when fishing with hooks from 50 to 97 feet under the surface.

Best results were also given by surface trolling at a speed of 6 knots.

Fishing took place only during daylight hours. It is possible that deep trolling can also be undertaken successfully at night. My past experience with surface trolling at night, however, has always been negative.

The catches included various species of tuna, Spanish mackerel, barracuda, dolphin, kingfish and "kutu" (*Aprion virescens* Valenciennes).

A motor boat can troll two sets of depth lines, one to starboard, the other to port. Assuming that each set comprises 3 lines, the whole is equivalent to fishing with *90 surface trolling lines*. The number of lines on each rig can be increased if the mainline is lengthened.

One of the drawbacks of this type of gear was that, at the beginning, we could not see when a fish was hooked on the depth line. It was first thought that by hooking a spring scale on the boat and attaching the mainline to it, we would overcome this. However, while this system worked well with a smooth sea, a moderate breeze made the scale-hand move around too much.

We finally came to the conclusion that the steel mainline and kite should not be taken up while fishing. Instead, each line would have to be rigged on a ring, enabling it to be pulled up the mainline by a separate pull cord. Unfortunately, time was lacking to carry out such an experiment.

This deep trolling method offers many possibilities; it is even possible to mechanize it. I feel sure that the deeper one trolls, the better the results will be. Many people in the Pacific have probably experimented with some kind of depth trolling gear, and it would be appreciated if any observations and comments were forwarded to the South Pacific Commission.

Insect Survey Of Micronesia

Insects of Micronesia—Vol. I: Introduction, by J. L. Gressitt. Bernice P. Bishop Museum, Honolulu, Hawaii, 1954; pp. I-IX, 1-257.

THE colonization of the Pacific islands by man has a universal interest, and its fascination is enhanced by the bold and perilous sea voyages which were necessary for its achievement. Man, however, is a relative newcomer in the Pacific, and however proper a subject for study he may be, much more is to to be learned of the ways in which the process of evolution takes place from a study of the animals and plants. They also made their journeys and voyages. More important are the changes and diversification which have occurred in them under the influence of isolation, and for such a study the Pacific offers unexcelled opportunities.

The ancestors of the majority of the animals and plants in the Pacific would appear to have invaded the area from the west, and only a relatively small number of the original invading species reached the easternmost islands of the Pacific.

Most of the insect faunas of the Pacific which have so far been studied have been, like those of Hawaii and French Oceania, near the eastern boundary of the Pacific and therefore small in size or, like those of Samoa and Fiji, at mid-distance on the invasion path.

Great interest thus attaches to a study of the fauna of places like New Guinea and Micronesia. The latter comprises the Caroline, Marshall and Mariana Groups north of New Guinea and east of the Philippines. Both are much nearer to the presumed point of entry into the region for the major part of the flora and fauna.

The Pacific Science Board and its specialist committee, the Invertebrate Consultants Committee, are to be congratulated both on their vision in undertaking, shortly after the war, a survey of the insects of Micronesia, and on their persistence in carrying it out.

Since 1947 a score of specialists, largely financed by the U.S. Office of Naval Research, have made insect surveys in the area. The large collections which are now available for study are, however, the work of perhaps 100 collectors, including the Japanese, who formerly controlled the area.

The Bishop Museum of Honolulu, which accepted the responsibility for arranging for specialists all over the world to study the different groups and the publication of their findings, is of course only continuing its active association in the past with work of this nature in the Pacific.

The Micronesian fauna is probably the largest Pacific fauna to be studied as a whole, and may be expected to throw much light on the origins, invasion routes and evolution of insects in the Pacific.

The survey was conceived as a contribution to pure science, but in the process much information has been accumulated on pest species and their distribution.

The present volume by Dr. Gressitt is an admirable introduction to the area under study. The area is defined and the maps, photographs and descriptions of typical environments enable one to form a clear picture of the conditions which exist there.

After the reports of the specialists on their particular groups have appeared, the whole fauna will be reviewed in a final volume. The new information which will emerge from these studies may modify some of the present ideas and conclusions on the origins and distribution of the Pacific fauna which are presented in this volume as a background to the study. The succeeding and final publication will be awaited with great interest. —*L.J.D.*

Development Of Pacific Fisheries

Fisheries activities of the South Pacific Commission since its inception are briefly reviewed below.

By A. H. J. KROON*

Delegates to the Fisheries Conference held at Commission headquarters in May, 1952, were taken to Ile Ouen, off the southern tip of New Caledonia, to watch demonstrations of native reef-fishing methods. This photograph shows native pirogues being towed to the fishing grounds by the motor cruiser carrying the delegates.

IT can almost be said that before the South Pacific Commission really existed it was interested in the development of fisheries. One of the projects which the Canberra South Seas Conference of 1947 (at which the Commission was established), recommended for early consideration as being of great importance to the economic and social welfare of the local inhabitants of the non-self-governing territories in the South Pacific was:

> *". . . fisheries research, including surveys and the testing of methods of catching and of processing fish and other marine products with the special aim of improving the nutrition of the local inhabitants."*

"Fisheries Methods" was one subject discussed at the First South Pacific Conference at Suva in 1950. The assembled delegates of the people of the island territories recognised the importance of fisheries in the South Pacific area, both as a source of economic wealth and a means towards improved food supply of the inhabitants, and listed a number of associated aspects for the special attention of the Commission.

These and other proposals for Commission activity in this field led to the holding of a conference of fisheries experts at Nouméa in May, 1952, to define more precisely the work which should be undertaken by the Commission. The objectives of the Conference were described as:

(a) To work out a practicable method of bringing together all the relevant information available on fisheries in the region;
(b) to suggest the best way of investigating quickly the problems of catching, processing, transporting and marketing, and of inducing people to increase the use of local fisheries products;
(c) to make constructive suggestions concerning a statement of the prerequisites for fisheries development in the region;
(d) to consider and advise what role the South Pacific Commission could play in the development of the fisheries in the region.

The Report of the Fisheries Conference (S.P.C. Technical Paper No. 25) was accepted as the basis of the Commission's fisheries programme.

Expert Engaged

In the light of that report and of further recommendations from the Research Council and Second South Pacific Conference, Mr. H. van Pel was engaged by the Commission as Fisheries Officer to carry out investigations and other activities in accordance with the Commission fisheries project. In particular, he is required, as a Commission specialist and in consultation with territorial administrations, to assist and stimulate fisheries investigation and development in the Commission area, including inland fisheries and pond culture.

Mr. van Pel's early experience in the fishing industry included six years as skipper of a steam trawler operating in the Atlantic and North Sea. In 1932, he joined the Netherlands East Indies Government as a fisheries officer, finally being appointed Director of the Bureau of Fisheries, East Indonesia. In 1951, he joined the Food and Agriculture Organization, and was sent to Pakistan to design a fishing harbour at Karachi. He later went to Liberia to train fishermen there in modern fishing methods.

Since assuming duty with the Commission in July, 1954, Mr. van Pel has visited Netherlands New Guinea (twice), Fiji, Western Samoa, American Samoa, Tonga and the Cook Islands. In August, Guam and the Trust Territory of the Pacific Islands will have the benefit of his services. His reports on fisheries developments and prospects in each territory are being made available, with the concurrence of the authorities concerned, for the information of other governments, territorial administrations and institutions to whom they are likely to be of interest.

Fisheries Training Course

A Fisheries Training Course will be held in 1956 by the South Pacific Commission with the generous assistance of the Food and Agriculture Organization of the United Nations.

The site of the training course will be Nouméa at Commission headquarters, where the course will have the benefit of the collaboration of the *Institut Français d'Océanie*.

The aim of the instruction will be to train personnel from Pacific territories so that they will be capable of working on fisheries development, either as junior fisheries assistants in local fisheries services or as active participants in other local activities, as, for instance, fisheries co-operatives.

* Dr. Kroon is Executive Officer for Economic Development to the South Pacific Commission.

Fish: A Valuable Pacific Island Food

The nutritive value of fish, and its importance in the diet of Pacific islanders, are discussed in this article.

By EMILE MASSAL*

IT is a common prejudice in many countries that fish is inadequate from a nutritive point of view. Very often it is completely omitted from the diet, and when by chance it is included in a meal it seldom constitutes the main course. This outlook originates from several known causes, the chief probably being lack of habit and ignorance of the nutritive value of fish.

Fish are, however, a tasty and highly nutritive food. Numerous works on the food composition of fish have confirmed its high protein, mineral and vitamin content. It has been proved perfectly digestible and its caloric value has been defined.

The composition of fish flesh, like that of any other animal flesh, is dependent on several factors, including species, age, physiological condition and external environment. Variations within the same species are mostly evidenced by a difference in fat content.

The caloric value of fish flesh is determined by the amount of fat it contains. Thus the distinction is drawn between the oilier species such as sardines, salmon, mullet, tuna, and mackerel; and the lean species (red-fish, barracuda, trevally, etc.). One kilogram of fresh fish from the former class provides 1,000 to 1,500 calories, while the same quantity from the latter gives only 600 to 700 calories.

High Protein, Mineral And Vitamin Content

The carbohydrate content is low, but the proportion of nitrogen in fish is roughly the same as in meat or poultry. It varies from 14 to 22%, so that fish constitutes a useful source of nitrogen. Moreover, fish proteins contain amino-acids "essential" to man; the tryptophane, methionine and lysine rates are relatively high.

As well as this high nitrogenous content, fish offers a greater quantity of minerals and vitamins than meat.

Fish, and especially salt-water fish, are particularly rich in phosphorus (2.29), calcium (0.22), magnesium (0.26), potassium (3.34), iron (0.11) (contents calculated in grammes per kilogramme of fresh fish meat), sulphur, copper, zinc, manganese, fluorine (0.60%), and iodine (0.55% approximately).

It is well known that the liver-oil of certain fish, particularly cod and halibut, is one of the richest sources of vitamins of the A complex. Important quantities of vitamins A and D are also found in the muscular flesh, especially in the oilier species. The vitamin B complex is present in notable quantity in the flesh of many fish. Vitamin C, however, is totally absent (it will be remembered that cases of scurvy occurred frequently and with particular severity amongst sailors).

The vitamin content varies considerably according to the species; figures are not necessary here since the reader may refer to food composition tables.

It may be concluded that fish is a bulk-providing nitrogenous item of diet, with a high mineral and vitamin content. It is an excellent source of energy, and its nutritive value equals and may even exceed, that of meat.

Always An Important Pacific Staple

In the South Pacific, fish has always occupied an important place in the diet of inhabitants of the smaller islands and the coastal regions of the larger.

"The Polynesian diet," writes Moerenhout, "consisted mainly of vegetables and fish, meat being eaten on very rare occasions only. Fish was abundant everywhere in their islands and the variety of species so considerable, that a special study might well be devoted to this subject alone."

Early explorers unanimously agree as to the very healthy condition of the island peoples; this in itself is sufficient proof, if proof be necessary, of the nutritive value of fish.

Moerenhout continues: "The natives of all the Polynesian islands, or at least those of the Society Group, were masters in the art of fishing, and I do not hesitate to claim they are as dexterous and skilful as any other people in the world. They knew how to intoxicate the fish with certain vegetable substances which, when thrown into the water, would cast the creature into a benumbed state; shortly afterwards it would rise and float on the surface as if dead. As for fishing methods proper, these were very numerous . . . the three main methods (were) with hook and line, net and dart or spear."

The same fishing methods also existed in Micronesia and on the shores of the Melanesian islands, where fish is similarly an important food. Thus everywhere in the Pacific fish was a staple and daily food.

It was mostly eaten fresh, roasted on hot cinders, or wrapped in leaves and braised in the native oven. It was often eaten raw, cut up in small pieces that the natives would dip, piece by piece, in salt water before putting them into their mouths[1].

The natives often prepared, in a calabash, a "sauce" made from seawater and pieces of fish, which they allowed to "mature" for several days; the result was somewhat similar to the Indochinese "nuoc-man".

The methods for preserving fish were rather primitive; very small quantities being smoked or salted. Sometimes the surplus of tuna or bonito in particular, was reheated daily, in the native oven.

The fact that supplies are plentiful and markets very limited explains the lack of interest of the South Pacific islander in methods of preservation. The practice of barter with inland peoples was restricted, although often fairly regular. In the Trobriands, for instance, the coastal dwellers still continue to exchange fish for the yams grown by dwellers inland.

Islanders Have Less Time For Fishing

At present, the inhabitants of the Pacific still remain faithful to fish, despite the introduction into certain islands of beef cattle, the development of stock-raising and imports of tinned meat. However, certain important changes have taken place.

Economic evolution has led many islanders to devote the greater part of their time to growing cash crops. Consequently, the time that can be devoted to fishing—or to subsistence crops for that matter—is very limited. As a result, the money earned from cash crops is largely spent on imported foodstuffs. In some islands small fishing industries have been established, though development has been limited. Their aim is mainly to supply markets in local towns. The produce of such enterprises, mainly tuna and bonito, is very highly appreciated by the villagers, who buy eagerly.

I have often witnessed a scene that proves the truth of this statement and gives food for further thought. The buses which leave Papeete late in the mornings for the various districts of Tahiti are weighed down with tuna and bonito bought at the market from the fishermen who bring them there for sale.

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* Dr. Massal is Executive Officer for Health to the South Pacific Commission.

1 Since the introduction of the lemon tree the fish is soaked in lemon juice and salt for a few hours until the flesh is really white. The soaking liquid is then drained off and coconut milk added. This dish of raw fish prepared in the Tahitian manner is often garnished with slices of onion, tomato and pimento.

Yet early that very morning the same buses had arrived in town from the districts, laden with the produce of family or collective fishing in the villages. Several reasons account for this movement of fish. A trip to town is a treat, especially with the prospect of financial profit from the sale of fish from the reef, which usually sells at a higher price than tuna or bonito. Furthermore, and this is probably the most valid reason, tuna and bonito fishing is seldom practised nowadays in the district areas.

Demand For Fish Still High

Village fishing has gradually become less productive but the Pacific islanders have not stopped consuming fish as a result. The high demand for tinned fish testifies to this fact. Salted or dried cod has proved very popular in some islands, although its consumption has never attained the proportions witnessed in the West Indies. At present the greatest demand is for tinned fish, in spite of its relatively high price: salmon ranks first, then sardines and finally tuna.

This tinned fish has excellent food value. For instance, 100 grammes of salmon provides 138 calories, 20 grammes of proteins, 11 grammes of fats, 40 mg. of calcium, 1.2 mg. of iron. Analysis of 100 grammes of any kind of fish preserved in oil indicates: calories 314, proteins 22 grammes, lipids 24 grammes, calcium 44 mg., iron 1.3 mg.

The popularity of fish preserves probably accounts for local attempts at preservation. A factory in Papeete was engaged for some years in tinning bonito in coconut oil. Various difficulties, such as irregularity of supplies, lack of local demand, and limited possibilities for exports, hastened its collapse.

The introduction of the frying-pan has brought considerable changes in cooking methods. It allows for rapid cooking and necessitates only a minimum of equipment. These advantages are slight, however, since from the nutritional viewpoint, frying in oil or fat destroys or reduces certain nutritive elements which are preserved entirely by baking in the native oven.

Thus fish is still a much-appreciated staple food in the South Pacific. Successive changes have been described; an attempt to forecast its future on the basis of present conditions will perhaps prove an interesting conclusion to this short article which is purposely intended to be of a simple nature.

Various attempts are being made to increase our knowledge of seafoods with a view to obtaining consistently larger catches. These will supply export trade, and local demand, in fresh or semi-preserved form. Experiments in pond cultivation are in progress. In New Guinea, some inland rivers have already been stocked with fingerlings. These trials seem to promise good results.

Fish-meal is already prepared industrially as cattle-food in Europe and America; it is now being produced in French West Africa and South Africa on a home industry basis as a food for human consumption. A relatively simple method has been devised for preparing adequate meals that keep well and have proved readily acceptable, even to children.

Having established production, there will still remain the problem of ensuring a system of distribution and developing a taste for fish amongst those who are either partially or entirely unfamiliar with it. Thus, an educational campaign will be necessary in some areas.

Industrialisation of fishing and fish products, and the marketing of fish, create problems which technicians are attempting to solve. However, fishing on a family basis should not be overlooked. This age-old activity has supplied numerous peoples in the Pacific with a highly nutritive, fresh, cheap and popular food.

Whether practised as an individual or group activity, occasionally with the participation of a whole village, fishing is a source of natural pleasure which provides opportunity for healthy competition, and is excellently adapted to both physical and mental capacities of our island peoples.

The young shoots and leaves of Ipomoea aquatica make a tasty and nutritious green vegetable.

Easily-Grown Semi-Aquatic Vegetable Is Highly Edible

THERE exists a plant in the same botanical family and genus as the sweet potato which can easily be grown and propagated by cuttings on flooded lands, in pools and along the banks of streams. This is *Ipomoea aquatica*, Forsk. (*I. reptans*, Poir., *I. repens*, Roth.) It is a perennial with a thick stem which bears at the nodes both the roots and the smooth leaves. The leaves are generally shaped like an elongated triangle and are supported by long stalks which stand erect above the surface of the water when the plant is growing on flooded ground.

The young shoots and the leaves provide an excellent green, which can be consumed either raw or cooked. In addition, this plant provides very good fodder for pigs

Its food value is good, as can be seen from the following chemical analysis which was taken from *Composition of Foods Used in Far Eastern Countries*, Agriculture Handbook No. 34, U.S. Department of Agriculture, Washington, 1952.

The high vitamin A value should be noted, as well as the appreciable amounts of mineral salts and vitamins of groups B and C. In the swamp forests of New Guinea, where Sago is the staple food, the use of *Ipomoea aquatica* shoots and leaves might prevent the vitamin A de-

TABLE SHOWING CHEMICAL COMPOSITION OF Ipomoea aquatica

COMPOSITION— 100 GRAMMES		EDIBLE PORTION	AS GATHERED
Refuse	%	0	19
Water	%	89.7	72.7
Food energy	Cal	29	23
Protein	gm	3.0	2.4
Fat	gm	0.3	0.2
Carbohydrate—			
total	gm	5.4	4.4
fibre	gm	1.1	0.9
Ash	gm	1.6	1.3
Calcium	mg	73	59
Phosphorus	mg	51	41
Iron	mg	2.5	2.0
Vitamin A value	I.U.	6,300	5,100
Thiamine	mg	0.07	0.06
Riboflavin	mg	0.12	0.10
Niacin value	mg	0.7	0.6
Ascorbic acid	mg	32	26

ficiencies which have sometimes been observed in the diet of the inhabitants.

Ipomoea aquatica is being grown at the Sigatoka Agricultural Station, Fiji, in an interesting experiment involving fish farming and green feed production in the same pond. The fish and vegetable matter produced are being used chiefly for pig feed.[1] The vegetable yield of this pond was the equivalent of 84 tons of wet material per acre in 9 months and, while the combination makes for a lower production of fish than could be expected in a normal pond, it is felt that this will be compensated for by the increased production of beef, milk and pork which can be expected from the use of *Ipomoea aquatica* as green feed.

—J.B.

[1] cf. Payne W. J. A. et al. *Fish Farming*, Fiji Agricultural Journal, Vol. 25, Nos. 3-4, Dec., 1954, pp. 71-76, illus.

Fishery Investigations In Papua And New Guinea

By A. M. RAPSON*

A PRELIMINARY survey of the fishery resources of Papua is being undertaken with a 60-foot vessel from Mackay, under charter to the Administration. Tests are being made with small-mesh trawl nets, mesh nets, long horizontal lines, vertical lines and troll lines. Although it was expected that the lines would yield most valuable results, only sharks have been captured with this gear, and for successful line fishing a supply of good bait will be necessary.

Up to the time of writing (April, 1955) results from a 20-fathom small-mesh trawl net have shown that there are extensive areas of clear mud bottom. In 26 tests of 40 minutes with this net in water 4 to 17 fathoms deep, inconvenient quantities of timber were taken on only one occasion, viz., in a position 2½ miles off the east head of the Purari River mouth.

Six species of prawns were taken in the Western Gulf of Papua, and there is evidence that differences in prawn stock will be found in the Eastern Gulf. Samples are being prepared so that expert opinion on the commercial possibilities may be obtained. As the net is of small mesh, the fish caught are mainly under 4 inches in length. Principal groups obtained are as follows:— Clupeoids, anchovies, threadfins, catfish, jewfish, and silver perch; in the Western Gulf considerable numbers of *Harpodon* were taken in shoal areas off the river mouths in positions where the influence of freshwater is considerable.

Future plans for the Fisheries Division call for the purchase of a specially designed 60-foot vessel for general fishery survey work. Orders have already been placed for a 30-foot motor boat and another of 16-foot, the latter to be used as a tender to the survey ship. All three vessels will be powered by diesel motors. It is anticipated that the 16-foot and 30-foot craft will be delivered by June.

During the past year, experiments with different types of gear in Papuan waters have shown possibilities in the use of new fishing gear for natives who still regularly engage in fishing by traditional village methods. Some experiments have also been made on methods of preserving fish with the aim of improving these to the point where fish can be marketed over a wider area than at present and retained in storage for longer periods.

Considerable difficulty is expected in getting increased native production for trading purposes and any marked rise in output will come only through organised fishing and introduction of new methods of preserving the catch.

A pilot project on pond fisheries is being established at Goroka to ascertain the possibility of developing fish production for inland regions from pond culture. One pond has already been constructed and stocked with about 200 tilapia imported from Singapore. This species resembles perch, and has proved very suitable in Malaya for pond culture where under favourable conditions the fish reach a weight of nearly 2 lbs. in 12 months. The Goroka experiment will establish whether tilapia will breed and thrive in the Highlands, where the climate and altitude differ considerably from their natural habitat. Experiments in Malaya indicate that this species will thrive at altitudes up to 4,500 feet.

Ponds for fish culture are constructed along small watercourses in shallow valleys with a low watershed, the pond being formed by building an earthen dam with cement drains and gates.

The Goroka project will comprise three small ponds of about one acre each on a waterway near the town. It will be about two years before any positive results from the experiment can be expected. However, as marine fishing offers the quickest means of increasing fish supplies for the territory, priority in development will be given to this phase of survey work. The long-range plan for fishing development is as follows:—

Introduction of new methods among native fishermen.

Encouraging native fishermen to organize their activities for development of their local fishing grounds.

Promoting interest in fishing by established native co-operative societies both for village consumption and as a commercial venture.

Training native fishing crews on Fishery Division vessels with the object of establishing mechanized native fishing fleets and giving village fishermen first-hand experience in modern techniques adaptable to community fishing.

Ascertaining potential fishing grounds for commercial operators in areas where these will not conflict or reduce the catch upon which village communities are dependent for part of their normal food supplies.

Exploring and testing the potentialities for ocean fishing by mechanized ves-

(Continued on Page 24)

* Chief of Division of Fisheries, Department of Agriculture, Stock and Fisheries, Papua and New Guinea.

Salt-making By Solar Evaporation

Salt, which plays an important part in fish preservation in many countries, may be obtained from various sources by different methods. This article outlines a technique for extracting salt from seawater by evaporation.

By H. VAN PEL

MOST of the fish salted in the South Pacific area is cured with expensive imported salt, often coming from remote countries. Salt-making is practised on a small scale in a few places in the area, but the product is of poor quality.

Several essential conditions must be fulfilled to make possible the extraction of salt from seawater by evaporation in the sun. These are:

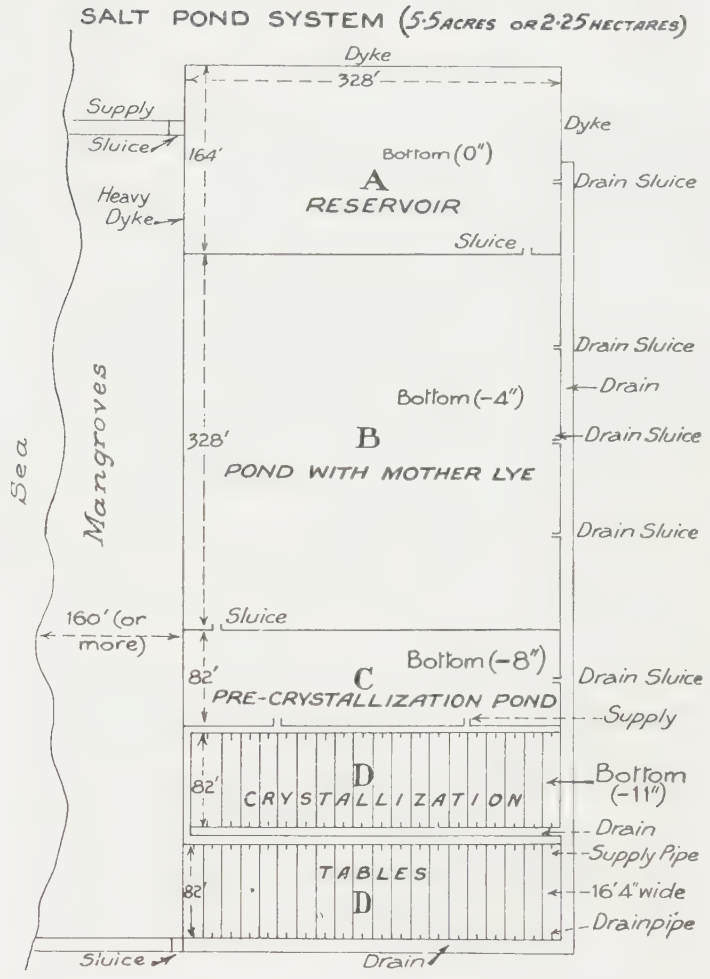
1. The salinity of the water should be at least 25 parts per thousand.[1]
2. The dry season must last at least five months.
3. There should be sufficient sunshine and, preferably, dry winds.
4. The soil forming the bottom of the salt ponds should not be porous.
5. The site should be close to the sea.

This article is limited to the description of small-scale salt-making, in order that the processes described might remain well within the possibilities of Pacific islanders living in areas where the five conditions enumerated above are fulfilled.

The system of salt ponds illustrated can be used with a tidal supply of water, if this is readily available, or else with windmill or motor-driven pumps. Normally, a small series of ponds established on level ground near the mangrove zone can use a tidal supply. Variations can be introduced in the design of salt ponds, provided the basic principles are respected.

Around the plot of ground where it is intended to build a set of salt ponds, a dyke should first be erected, sufficiently high to prevent any flooding either from the sea or land side. The part of this dyke facing the sea must of course be the strongest.

Smaller dykes divide the area thus enclosed into four parts (see sketch):



(i) The reservoir and settling pond A.
(ii) Pond B used for mother lye.
(iii) A pre-crystallization pond in C.
(iv) The salt tables or crystallization tables in D.

The bottom drops gradually from the reservoir to the tables so that the bottom in B is 4" lower, in C, 8' lower, and in D, 11" lower than the bottom of the reservoir.

The relative sizes of Ponds A, B, C and D are in the proportion of 2 : 4 : 1 : 2, i.e., Ponds A and D are twice as large as Pond C; Pond B is four times as large as Pond C.

The maximum depth of the seawater and of the lye in the various ponds should be:

in A — 20"; in C — 4"
„ B — 10"; „ D — 2"

The relation in volume will then be 10 : 10 : 1 : 1.

Before salt-making operations are commenced, it is necessary to run about two inches of water into the ponds, let the water soak into the ground, and repeat the operation as often as necessary until water no longer leaks through. The tables are submitted to a similar treatment and stamped or rolled absolutely flat. This work should be completed before the beginning of the dry season, so that no time will be lost for actual salt-making. If it should happen to rain during the dry season, the rain water should be drained away through sluices or drain pipes.

Salt Extraction

Pond A is first filled with seawater and all the solids in suspension are allowed to sink to the bottom. The water should be as clear as glass before it is let into Pond B.

During the settling period, some evaporation takes place, and the concentration may reach a maximum of 10 Baumé[1]. In Pond B, the mother lye further evaporates till it reaches a density equivalent to 23°, or at most 25°, Baumé. The solution then goes into Pond C, where it reaches a concentration of 27° Baumé.

From the time when the lye reaches a concentration of 25.2° Baumé, iron

(Continued on Page 32)

1 Ocean water has an average salinity of 35 parts per thousand.

1 The Baume graduation is used to express the density of liquids. The hydrometer reading in Baume degrees gives an approximation of the percentage of salt in a salt solution.

Rehabilitation Of Pearl Oyster Beds In French Oceania

The author, with native assistant, preparing to shoot a plankton net in Hikueru Lagoon.

Once rich in pearl oyster beds, many lagoons in French Oceania have become exhausted due to over-exploitation by man, and to natural causes. Practical measures to restore their productivity are detailed in this article.

By GILBERT RANSON*

DURING a mission to French Oceania I studied the conditions under which pearl oysters were living in the Hikueru and Takuma lagoons. Shorter visits were made to other islands—Kaukura, Apataki, Takapoto, Takaraoa, Raroia, and Fakarava. I went also to Niau and Makatea, where, although no oysters are to be found, I was able through observations to understand better the evolution of the other islands.

I recorded water temperatures and salinities, collected plankton, studied the growth of the pearl oyster at various depths, the nature and condition of bottoms, the direction of bottom and surface currents, and the evolution of the oyster's reproductive glands.

At the outset I found that 35 lagoons, previously prosperous, now produced only negligible quantities of pearl shell, or had completely stopped producing; 8 had still an appreciable yield, and only 6 were rich.

Let us examine the reasons for such an evolution, after briefly reviewing the main points of the biology of the pearl oyster.

Biology Of The Oyster

In pearl oysters the sexes are distinct. Male and female oysters can be differentiated. Japanese scientists have made very detailed studies of the Japanese and Celebes pearl oyster, and have found that they change sex from one year to the other. It is therefore impossible, from the mere examination of the shell, to say whether the specimen is male or female. To do that, it is necessary to examine the reproductive products of each under a microscope.

The ratio of male to female oysters is highly variable, according to localities. In the Hikueru lagoons I have observed a preponderance of males in some places, of females in others, and more or less equal numbers of each sex elsewhere.

A pearl oyster five to six years old can produce some tens of millions of eggs, while the number of spermatozoa emitted by a male is more than ten times greater.

When one year old the oyster already gives forth sexual products, but it is not certain that they are viable.

The time of the year when the eggs are produced has been the subject of numerous observations which, however, do not agree with one another. In fact, the reproductive glands are only functional from October to February, that is, during the Austral summer. From March to September, the winter months, the glands contain only remnants of more or less degenerated sexual products.

When a favourable set of circumstances occurs, an astronomical number of eggs and spermatozoa are released by the female and male pearl oysters. They sink to the bottom or are carried away by the currents. The eggs are rapidly fertilized. Within 24 hours an egg of good conformation (only one-half to two-thirds are) is transformed into a small ciliate larva, capable of minute vertical movements, which remains near the surface of the sea. This larva is, however, unable to swim against the slightest current, which carries it away. It is part of the plankton. All marine animals from the fish down to the smallest crustaceans eat these larvae.

For 21 to 25 days, a plaything of the currents, it grows and undergoes many transformations. On the second day it is equipped with the embryo of a shell. Gradually its internal organs become complete and our larva, measuring about one-fiftieth of an inch on the 21st day, is near the end of its planktonic life. It is about to undergo an internal metamorphosis. It drops to the bottom and, provided it finds a suitable support on which to attach itself, it goes on living. Otherwise, it dies or becomes a prey to the innumerable enemies lying in wait. Myriads die in this way.

The young survivors still have to face many new dangers, including fish, crustaceans, molluscs and echinoderms. Again many will die. Very few will

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Setting out collectors of mikimiki wood in Hikueru Lagoon. Several months later it was observed that considerable quantities of young oysters—more than had been hoped for—had attached themselves to the collectors.

reach the adult stage. For each million eggs spawned, only from one to ten will go on to perpetuate the species. The number of parent oysters necessary to ensure the survival of the species in a given locality can now be gauged. When the breeding stock fall below a certain number the total extinction of the population will sooner or later become a fact.

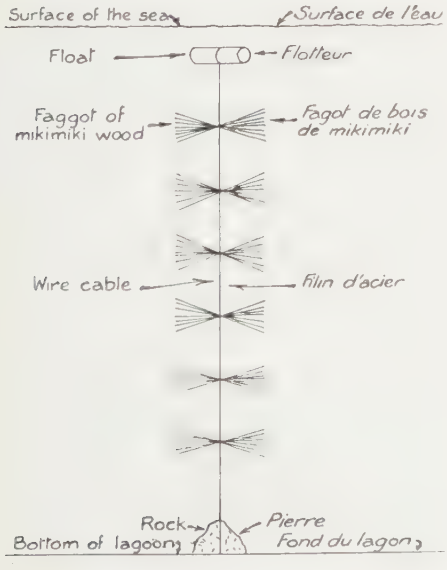
The larvae, which have been dispersed by the currents, attach themselves anywhere, even in places where the adults will vegetate for the rest of their existence. The adult stages can withstand severe conditions. However, only those living under very favourable conditions will give birth to normal progeny; their eggs will be well constituted. The particular zone where these conditions obtain may be considered as the "nest of the species." If the breeding stock is taken away from it, the species ceases to be. In the case of the pearl oyster of French Oceania, these favourable conditions are found only in the deep parts of the lagoons.

Reasons For Lagoon Exhaustion

In the light of these facts we are now in a position to understand what has happened in the course of time in the pearl-shell producing lagoons.

The evolution of the lagoons, with regard to the problem under review, results partly from the disorderly activities of the men who have exploited them, and partly from the combined action of natural phenomena over which these men have no control. The former should be brought to a stop, and we should try and solve the difficulties caused by the latter.

SKETCH OF A FLOATING COLLECTOR
SCHEMA D'UN COLLECTEUR MOBILE



Attempts have been made through successive regulations covering fishing operations, and also by a division of some lagoons into "sectors" (measures excellent in themselves), to minimize the effects of over-exploitation. But these steps were not sufficient. Nothing was attempted to obviate the untoward effects of the natural phenomena which hamper the reproduction of pearl oysters. The main points were overlooked.

I have mentioned that the spawning of pearl oysters in the Gambier and Tuamotu Islands takes place from October to February. The fishing season should not coincide with the breeding season. This problem is easy to solve in the Tuamotus, where the water is never very cold (79° to 86° F.). I have therefore proposed that in future the lagoons of this Group be opened for diving from April to July only.

In the Gambier Group the problem is more complicated, as the seasons are more definitely marked. In winter the water is colder and diving is not possible. After studying the question closely I have proposed that an open season be declared from January 1 to April 30 in all islands south of 20° S.

We have seen how, for every million eggs released, only one to ten will eventually become adult oysters. This is the most important factor affecting the prosperity of a lagoon. Tens of thousands of progenitors, concentrated over a comparatively small area, are necessary to ensure the continuity of the species. Over-fishing is fatal in that it decreases the stock in a dangerous manner.

There was over-fishing in the lagoons long before 1900: in 1863, Bovis was already requesting regulation of the fishing.

All the steps taken since, such as dividing some lagoons into three areas which are each in turn opened to diving, and the opening of other lagoons in rotation, are excellent, and those at present in force will be maintained. They are aimed towards conserving pearl shell resources in the lagoons.

Establishment Of Reserves Essential

However, these steps have not been sufficient. The main point has been overlooked; the establishment of "natural reserves" to assure, on a permanent basis, the necessary breeding stock.

It might be assumed that the parts of the lagoons which are closed to fishing for two or three years contain enough progenitors, or that the fact that a lagoon is not open to diving for three or four years ensures its restocking.

This is not so. After the fishing season, pearl oysters are too few and too far apart in these areas. The few male or female oysters which have escaped the divers are often too far from each other. A large number of eggs is never fertilized.

In addition, almost all the old oysters are gathered, and there remain on the bottom only young oysters from one to three years old, which are probably not capable of releasing viable sexual products. In order to have progeny, one needs oysters four years old or more, in large numbers and concentrated on some favourable bottom.

The necessity for a reserve in each lagoon is obvious. From 50,000 to 100,000 mature pearl oysters, living under good conditions, would produce fabulous quantities of fertile eggs. In spite of the high mortality there would

still remain in the sea considerable numbers of larvae which, carried by the currents and wind, would go and attach themselves wherever suitable supports were to be found in the lagoon.

This proposal of mine is not so extraordinary. For quite some time the necessity for "game reserves" and "fish reserves" has been recognized. Natural sanctuaries have been established here and there around the world, in order to prevent man from driving into extinction some animal or plant species. The principle which actuates me in the case of pearl oysters is the same.

The first idea of Mikimoto, when he organized his scientific pearl farm in Japan, was to establish "natural beds", reserves of breeding stocks over which he kept a zealous watch, and which he never touched. He knew well that they were his most precious treasure.

In Hikueru and Takume, I have shown how these reserves should be established. At present, reserve areas have been surveyed in all pearl-shell producing lagoons.

Let us assume that we have our reserves of progenitors. These will produce thousands of millions of larvae. We have got to look after these, to make captive the greatest possible number. This is the second major problem of the oyster man.

As previously observed, the larva at the mercy of currents for 21 to 25 days will grow and undergo transformations. At the end of its planktonic life, it sinks to the bottom. If a suitable support is there on which it can attach itself it goes on living; otherwise it dies.

A few are distributed irregularly in the lagoon and drop to the bottom, to provide later the divers' catch. I said a few. Indeed, as the larvae live very near to the surface, winds and currents will carry the majority of them to the leeward side of the lagoon. Some will find supports there and vegetate, but by far the greatest bulk will die for lack of suitable supports. (From now on I will refer to these supports as "collectors", the name by which they are known among oyster men. Their importance can be appreciated.)

What can we do to collect the greatest possible number of these two lots of larvae?

For the larvae to establish themselves on the bottom of the lagoon, they need rocks or shells. Sand is fatal to them. These rocks or shells must be clean and free of any plant or animal life. An oyster larva cannot settle on a rock covered with living coral.

This is where the natural factors come in quite independently of the activities of man. In the course of time the sea slowly but relentlessly throws sand into the lagoon. Gradually the thickness and surface of the sand increase. The depth of the lagoon decreases. Shallow lagoons are threatened first. In the deeper ones, sand is found only on the bottom, between the rocks of various sizes, which may be small submarine hills or peaks.

When a shell or a piece of dead coral is found on a sandy bottom, it is uncommon not to find an oyster attached to it. It is easy to appreciate—and the pearl-shell diver is well aware of the fact—that if there were millions of clean shells or rocks on the sandy bottom of a lagoon there would also be approximately the same number of oysters.

The cyclone of 1906, which spread devastation in some islands, threw into the lagoons a large number of uprooted trees. These served as supports, or "collectors", and were rapidly covered with pearl oysters. A diver from Hikueru told me, emotionally: "At the bottom of the lagoon there were as many oysters on the dead tree as there are leaves on the living tree standing in front of us."

Takume, a second-rate lagoon before the hurricane, became afterwards a high-producing one.

This lesson, given to us by nature itself, should not be lost.

At present the oysters are mainly fixed on to the rocks which have not yet become covered by sand. They have, however, become progressively covered with various forms of life, and free space is scarce. It would be necessary to heap rocks and blocks of dead coral on the bottom of the lagoons to replace these natural collectors which have become unsuitable for the oysters.

Provision Of Collectors Essential

Thousands of tons of shells, wood and rocks are what a well-advised oyster man would put in the depths of the lagoons in order to harvest large quantities of oysters. The advice I gave to the islanders wherever I went was: "You must do as the hurricane did, and put in your lagoons everything you can in the way of shells, rocks and wood."

Other larvae, by the thousands of millions, are driven ashore or out to sea through the passes. Once the areas to which they are driven are known, suitable collectors should be placed there in order to intercept as many as possible. All round the world it is in such numbers that the larvae of edible oysters are thus captured. In the region of Marennes alone, in France, over 2,000 million attach themselves to the collectors prepared and staked out by the oyster farmers each year. From these, after five years, and in spite of losses amounting to 50% and over, come the 900 million oysters annually consumed in France. It is also in this way that Mikimoto collected his pearl oysters in Japan.

A great variety of materials are used for collectors, but rocks, shells and wood are the main ones.

Once the young oysters fixed on the collectors are three to four months old, they are spread out in depths of 60 to 80 feet, which are more suitable for their growth. So you will see that after the collecting comes the farming.

The cycle is complete when the lagoon has been organized scientifically, and is ready to supply the required quantities of pearl shell. Each lagoon should have a reserve of progenitors, the various collectors and the farming areas.

In the Tuamotu Islands, I have carried out as a demonstration, a large-scale experiment. I had some 8,000 bundles or faggots of "Mikimiki" wood prepared in Hikueru, and 4,000 more in Takume. These represented respectively 1,000 and 500 collectors, at the rate of 8 faggots to each. For this work, we used 18½ miles of rope, 1,500 floats and 1,500 rocks or pieces of pig iron weighing over 65 lbs. each. These collectors were put in the water in October and November, 1952.

Because of the means of transport available and of the distances between the islands, great difficulties had to be overcome in order to carry out this experiment.

From a letter from Hikueru in February, 1953, I learned that considerable quantities of young oysters (more than we had hoped for) were fixed on the collectors. From the biologist's point of view, this is a demonstration. On the economic plane, its consequences will be of importance for French Oceania.

By the general application of such measures, large numbers of young pearl oysters can be caught in the lagoons of Oceania which are still producing. All the poor lagoons can be improved, and those which have been exhausted can be restocked.

Fishery Investigations In Papua And New Guinea

(Continued from page 20)

sels on fishing grounds beyond the coastal areas.

Developing methods of processing and marketing fish for both native and European consumption.

If the Goroka experiment on pond culture is successful, construction of inland fishing ponds to help meet the need for protein food and to reduce imported meat supplies for these areas.

The processing of unpalatable and wastefish into fishmeal for livestock and poultry. The Fisheries Division has processed a small quantity of fish meat at Port Moresby and although the quality was poor, the grade will be improved when better equipment is constructed.

It is emphasized that development of the territory's fishery resources could contribute materially towards raising the protein value of the native diet, which in many localities is below the desirable level for general health, despite the yearly importation of nearly £1,000,000 worth of canned meat.

Salt Supply Problems In Papua & New Guinea

An essential item of human diet, salt is produced by primitive peoples in many often ingenious ways. This article describes several used in New Guinea. There, the problems of salt production vary widely, inland peoples finding greatest difficulty in obtaining adequate supplies.

By H. S. McKEE*

THE term "salt" in its widest sense includes a great variety of substances, whose common feature is their formation by the action of an acid on a base. In everyday life, however, and in nutritional contexts, "salt" refers to a single substance, sodium chloride. This substance contains two elements, sodium and chlorine; both are needed by the human body, but requirements of sodium have been more thoroughly studied than those of chlorine. In hot climates there is an increased need for salt, as it is lost from the body in sweat.

Animal foodstuffs contain comparatively large amounts of salt, and hunting peoples who live mainly on meat often add no salt to their food. Diets based on vegetable foodstuffs contain much less sodium and those who eat them find the addition of salt desirable.

Salt From Seawater

In the coastal districts of New Guinea the supply of salt is obtained largely from sea-water, either used as such or evaporated to give a dry product. The supply of salt for the large populations who live far from the coast is a real problem. Salt is traded widely through the interior from the coast and in some areas seawater is even carried to villages a few miles inland. Salt imported from overseas is known to have reached many inland areas, but it is uncertain what proportion of the population uses it. Salt imported into the Territory of Papua and New Guinea provides roughly 100 mg. per person per day, equivalent to 1½ ounces per year. It is probably important in particular areas or for some sections of the population, but can hardly have great nutritional significance for the territory as a whole.

From Salt Springs

Several inland peoples, including some of those at the most primitive stages of development, produce salt from salt springs. A method used in several places is to soak dry wood in the salt water, and then burn it. The ashes are extracted with water and the solution evaporated. Analyses are available for several samples of salt made in this way in the mountain districts of Australian and Netherlands New Guinea. All these samples consisted essentially of sodium chloride mixed with varying amounts of impurities such as charcoal from incompletely burnt wood.

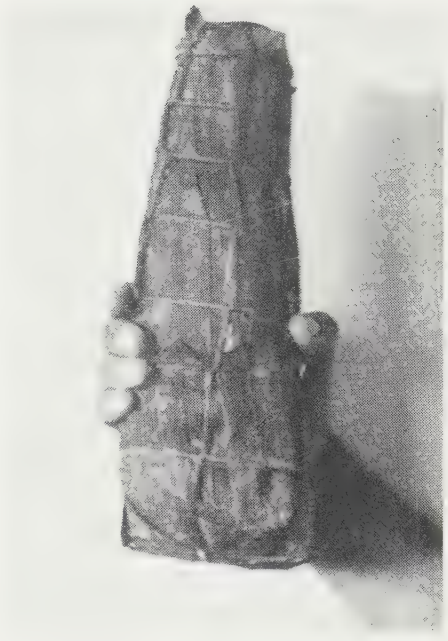
From Plant Ashes

In places where salt springs are lacking, plant ashes are also used as a source of salt. The processes used can be surprisingly elaborate for people whose material equipment is on the whole primitive. The method used at Azana in the Menyamya region of the Morobe district (Territory of Papua and New Guinea) has been described by Patrol Officer W. M. Purdy as a result of observations made on a patrol in 1954.

In this area salt production has been established for a long time. An area of about 15 acres is planted with a tall grass called pit-pit (*Saccharum* sp.), and is irrigated by channels coming from two creeks. The pit-pit does not have to be replanted as the clumps send up new stems after cutting. They are cut at a height of about 8 feet, by men and women working together, and laid on the ground to dry. The men then collect large quantities of firewood in the bush and the pit-pit is burnt on large fires, filling the valley with smoke like an industrial area. Each fire when it is finally allowed to burn right down produces a heap of ashes about 5 feet high. A fence of sticks is made around each heap and the top is covered with a roof made from kunai grass (*Imperata* sp.).

An arrangement of sticks bearing a line of gourds is then set up, each gourd having an open top, and at the bottom a small hole covered with prickly seeds to form a filter. Ashes are placed in the gourds and water is run through, dissolving soluble material in the ash. The gourds discharge into a long pandanus leaf which acts as a spout from which bamboos are filled.

Many bamboos are filled and carried to two "factory" houses, long, low timber buildings each containing a large clay stove. The stoves are 12 feet long and 4 feet wide, with an open space for the fire beneath. The flat top of the stove has crosswise oval grooves. A specially strong banana leaf is placed in each of these and is filled with solution from the bamboos. A large fire beneath the stove evaporates the solution, more being added until a long solid block of native salt is formed. This is wrapped in the banana leaf and made into an artistic package with the plaited stems of a liane.



A packet of native salt from the Wissel Lakes district, Netherlands New Guinea.

The production is divided among the men of the village, the packages being kept in their houses above the fire. Men come from all the surrounding districts to trade for this salt, which is much preferred to imported salt, at the high price of a new tomahawk for a packet containing about 9 pounds.

Analysis of this salt shows that it contains no sodium chloride, being mainly potassium chloride with a little potassium sulphate. A similar salt made in Netherlands New Guinea from the ashes of a fern also contained mainly compounds of potassium.

In West Africa, especially in the French territories, native salts made from plant ashes have been extensively studied. In a few cases plants growing in saline soils have yielded products with a high content of sodium chloride, but in more normal areas the salt produced in this way consists, as in New Guinea, essentially of potassium compounds.

This potassium seems unlikely to be of value in the diet, as any diet consisting largely of plant products will supply potassium in excess of human requirements. It would therefore appear that these laboriously-prepared salts are of little nutritive value. It has been sug-

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gested that the requirements of the human body for sodium can in part be met by potassium, and alternatively that the chlorine of the potassium chloride is valuable. The information at present available on human requirements for sodium, potassium and chlorine, especially as affected by climatic effects and racial differences, does not permit any clear decision on the correctness of these suggestions.

Iodized Salt For Goitre

Salt is also of interest in connection with endemic goitre, a disease characterized not only by swelling of the thyroid gland in the neck, but also by mental impairment. This disease is usually caused by lack of iodine in the diet. The human requirement for iodine is very small but if it is not met the consequences are serious. In most parts of the world minute amounts of iodine taken up by crops from the soil, or present in drinking water, are sufficient to maintain human health; fish and marine products also contain enough iodine to supply those who eat them in moderate amounts. Goitre is thus characteristically found in inland districts where marine foods are not available and where the content of iodine in the soil is low.

In several countries the addition of minute amounts of iodine to salt for human consumption has been effective against goitre. It is usually added as potassium iodide, but recently potassium iodate has been recommended as being more stable in salt which contains impurities, or is liable to become wet or be exposed to excessive heat before being used.

As goitre occurs in New Guinea, the question of iodizing the salt used there should be considered. The cost of adding iodine is small, and iodized salt is already being made in Australia for use in iodine-deficient areas there. Technical difficulties in supplying iodized salt to New Guinea would not be great, but greater difficulty might be encountered in getting it to those who need it most.

Salt In Food Preservation

Salting is an important method for the preservation of food, particularly fish, and the quality of the salt may determine whether the product is satisfactory. The main value of salt as a preservative is that it kills micro-organisms, but some salts, particularly those prepared from seawater, are contaminated with salt-resistant bacteria. Their presence in salted fish produces soft decomposed areas which are usually pink or reddish. Such contaminated salt can be sterilized by heating in shallow trays over a fire. Considerable amounts of imported salt are used in New Guinea for preserving crocodile skins. It is very important to use good quality salt for this purpose, as well-prepared skins command high prices, but the value falls considerably for those of lower quality.

Importance Of Salt In The Diet

Most of us, if we think about salt at all, regard it as a condiment, an addition to our food rather than an essential part of it. Salt, however, is much the most convenient source in the diet of substances needed by the body, especially in hot climates. Its importance is underlined by the laborious methods and long trading routes used by primitive peoples all over the world to get salt or substances which they consider to be its substitutes.

There can be little doubt that in New Guinea the increased distribution of good quality salt, whether imported or made locally, is very desirable. Salt production by modern methods should be practicable on the drier stretches of the south coast, and possibly at some of the inland salt springs if the volume of brine is adequate. Salt is also worthy of consideration as a vehicle for the distribution of iodine and possibly of other elements necessary for health but required only in minute amounts.

The Story of Talidig School

(Continued from Page 14)

his pleasure that the women wanted to co-operate.

With this auspicious beginning, everything proceeded according to plan, and the only slackening in tempo was a brief break for Christmas Day and the traditional New Year village "sing sing" and dance. Every task had its special lesson for the future. Timber cutters learned to select only the best hardwood trees; the school gardens were replicas of model demonstration plots at the Madang Agricultural Station; and the size and spaciousness of the new dormitory buildings set the villagers wondering what it would be like to have houses of a similar design. Meanwhile the construction teams were learning how to use the new tools purchased with community funds, and the basic principles of the carpenter's craft. Others gained experience in marking out and making wide attractive road approaches, and selecting the ornamental shrubs and permanent trees for shade avenues.

A demonstration of disinterested co-operation was given—although without any direct intention—by a European planter of the general Talidig area, who loaned his truck for hauling timber from some of the more distant stands. Maximum use was made of native materials, for the people were not only erecting a school but obtaining all the materials from their natural source of supply—the bush and jungle. Many familiar native skills were utilized, for the aim was to build in the native tradition and with native materials but utilizing these to get better results and more permanent structures than with the old-type buildings.

The Native Medical Assistant made his special contribution by constructing three large canoes for the use of the school, for Talidig is near the sea and fishing supplements the food supply.

By January 8, when Mr. Stanley had to return to Madang for the opening of the school year, one classroom block measuring 60′ x 20′ was finished, as well as an office 30′ x 20′, and work had started on two of the six dormitories required for the students. One member of the building teams had proved he was quite capable of taking over supervision of construction, and was assisting four younger men who showed similar aptitude for the work. He was placed in charge of the uncompleted building programme, and Mr. Stanley arranged to visit Talidig once a week to check the progress made and give whatever advice necessary.

Plan For Village Requested

Before Mr. Stanley left Talidig, the Luluai and Village Councillors made a request which justified his faith in his belief that the school project would create a desire for improved standards. They asked that he mark out a village for them using a similar plan to that of the school grounds as they wished to build new houses like the dormitories constructed for the students. Also, the people were showing active interest in beautification of their villages through the planting of flowering shrubs and trees, while food gardens were being improved and extended. More than a thousand banana plants, five hundred pineapples and two thousand young taro plants had been set out in new ground.

Apart from some nails and tools, none of the new buildings had involved any cash outlay, for the materials used were kwila posts and framework (kwila is the best hardwood in the territory and is regarded as pre-eminent by commercial timber concerns), Morato roofing (a type of palm leaf thatch which sheds rain very effectively), split palm flooring, and walls of plaited bamboo. The new buildings also had specially-plaited bamboo blinds or shutters at the windows as protection against rain and sun.

Twelve villages are represented in the school enrolments, with 51 boys and 10 girls in attendance. The staff comprises three native teachers.

That is the story of the Talidig School, which is opening up new horizons for children and adults alike. It provides a means of progress stemming naturally from the familiar level of village life, is practical in its application, tangible in its results, and based on the bedrock of the people's own desire for advancement.

Sigatoka Agricultural Station (2)

Livestock at Sigatoka is described in this second and concluding instalment.

By W. J. A. PAYNE

Officer in Charge, Sigatoka Agricultural Station, Department of Agriculture, Fiji

The Ongole-Krishna Valley type Zebu cattle on the hill grazings.

Dairy Cattle

THE aim is a herd of 40-50 milking cows together with their followers grazed on the alternate husbandry and permanent pastures on the alluvial flats and the lower hill fields. At present the herd numbers 46 milking cows and heifers.

A Friesian herd was maintained at the station until 1950, when it was decided to transfer it to Koronivia and to start a new herd of Shorthorns. The Friesians were transferred gradually between 1950 and 1953. Pedigree Illawarra Shorthorn heifers were purchased from Australia in 1950, and pedigree and grade Milking Shorthorn heifers from New Zealand in 1951, to begin the foundation herd at Sigatoka.

Three Illawarra Shorthorn bulls have been imported from Australia, and one New Zealand Milking Shorthorn bull has been purchased locally. Unfortunately two of the Illawarra Shorthorn bulls had to be destroyed and have left few progeny. The third bull, imported during 1954, is of special interest as he was purchased partly on the basis of a heat tolerance test. It is believed that this is the first time that a bull has been selected in a temperate country for a tropical by a heat tolerance test.

Milk Records of Sigatoka Herd

The Sigatoka herd has been milk-recorded since 1941, but has only been butter-fat tested since 1951. Yields during the period 1941-53 are shown in Table 1. The Shorthorn herd is not yet of course a balanced herd as it is composed entirely of young animals.

The present breeding policy is to import heat tolerance-tested Illawarra Shorthorn bulls from Australia and to progeny-test them. If a bull is imported that "gets" outstanding progeny the herd may be "closed". Breeding up the new herd will be a slow process as it will only be possible to progeny-test one or two bulls a year, even when the herd has attained its maximum size.

Poor producers are not being immediately culled, but are being served with Zebu bulls in order to produce a first-cross beef animal that will never be used for breeding purposes but will be raised on the hills for beef.

Table 1: Production of Dairy Herd at Sigatoka, 1941-53.

YEAR.	BREED.	PRODUCTION. Milk (*Corrected 305 days*) (lb.)	Butter-fat (*Corrected 305 days*) (lb.)
1941	Friesian	1,327	—
1942	Friesian	1,960	—
1943	Friesian	2,748	—
1944	Friesian	2,983	—
1945	Friesian	3,252	—
1946	Friesian	3,688	—
1947	Friesian	4,036	—
1948	Friesian	4,685	—
1949	Friesian	4,998	—
1950	Friesian	5,183	—
	Shorthorn	2,498	—
1951	Friesian	5,099	—
	Shorthorn	4,380	—
1952	Friesian	4,463	161.4
	Shorthorn	4,074	152.2
1953	Shorthorn	2,682	102.6

In addition to the Shorthorn herd there are eight sets of Jersey or part-Jersey identical twins in the station dairy herd. These are used as experimental animals.

Milk and cream are sold locally, and surplus cream is manufactured into ghee. The station is pioneering hygienic liquid milk sales, the milk being packaged immediately after milking and sold in attractive waxed paper cartons to the consumer. Bulk refrigeration equipment is being installed.

Beef Cattle

A small herd of Ongole-Krishna Valley type Zebu cattle were purchased in 1950. These animals are of the same type as the American Brahman (the foundation herd was originally imported from Texas by the Colonial Sugar Refining Company). They are being bred pure, and the bull is also being used to produce first cross Zebu-Shorthorn, Zebu-Jersey, and Zebu-Friesian calves to be used for beef only (not to be bred from).

It is planned to maintain a purebred herd of 20-25 breeding cows and heifers although at present there are only 12 and breeding stock will eventually be available for local farmers and for export to other South Pacific countries. The herd is particularly valuable as it is one of the few herds of Zebu cattle in the world thought to be free of all tropical disease and external parasites such as dangerous ticks, as well as having been tested for tuberculosis.

Four young bulls of the Santa Gertrudis breed were imported from Australia in April. They will be used to grade up local cattle to the Santa Gertrudis type

Crossbred Berkshire x Tamworth gilts, six months old and weighing 195 pounds.

on a Colony-wide scale. At Sigatoka a herd of Red Polls will be graded up to the Santa Gertrudis.

Pigs

The Department owns three herds of purebred pigs—Tamworth, Large White, and Berkshire. Originally the Tamworth and Large White herds were kept at Sigatoka, but breeding was on a very small scale. In 1951 the Large White herd was transferred to Koronivia, and two Berkshire boars and two gilts were imported from New Zealand in order to start a nuclear herd of Berkshires at Sigatoka.

The piggeries have now been considerably altered and extended, and some twenty-four breeding sows or gilts are kept, 9 Tamworth, 9 Berkshire and 6 crossbred Tamworth x Berkshire. The station supplies Tamworth and Berkshire breeding stock and is now offering Tamworth x Berkshire gilts to pig farmers in the Colony for the production of pork. Some details of the productivity of the pig herds at Sigatoka are given in Table 2.

Table 2: Prolifacy and Growth of Pigs at Sigatoka.

YEAR.	AV. NO. BORN ALIVE.		AV. WEIGHT AT BIRTH.		AV. NO. WEANED.		AV. WEIGHT AT WEANING.	
	Tam.	Berk.	Tam.	Berk.	Tam.	Berk.	Tam.	Berk.
1947	7.5	—	2.9	—	—	—	—	—
1948	6.5	—	3.0	—	4.5	—	25.4	—
1949	7.5	—	3.5	—	6.5	—	26.9	—
1950	7.4	—	2.5	—	6.9	—	19.6	—
1951	9.0	—	2.8	—	6.8	—	29.7	—
1952	7.7	7.3	2.7	3.0	7.1	5.0	23.7	33.0

Goats

The goat herd was established during 1950, does being purchased locally. Local does are being crossed with imported grade Angora and purebred Saanen bucks. The aim is to produce a suitable meat goat, as the local demand for goat meat is high and the average dressed weight of the local goats is only 18-20 pounds. At the present time the herd consists of 196 breeding does, the total number of goats being 295. It is planned to keep a herd of 300 breeding does including pure Fiji and crossbred Fiji x Angora, Fiji x Saanen, and Fiji x Angora x Saanen does. Details of the fecundity and growth rates of the different types of goat are given in Tables 3 and 4.

The goats and beef cattle are run on the hills together. The demand for breeding stock from the station is very high, particularly for first-cross Angora x Fiji bucks.

One and two-year-old crossbred Angora x Fiji does.

Fish

A fish pond has been established at the station during 1954. It is associated with the piggery, effluent being run into it in order to encourage the growth of micro-organisms on which the fish live.

Fifty fingerlings of the African carp *Tilapia mossambica* were imported in January, 1954, from Malaya and placed in the pond. They have thrived and reproduced at Sigatoka, and fingerlings are now not only being distributed all over the Colony but also are available for sale to other South Pacific territories. The aquatic plant *Ipomoea reptans* has been grown on the surface of the pond, and this has been found to be a very useful vegetable for human consumption as well as a very palatable green feed for the pigs.

Experimental Work

Major investigational work is confined to problems of pasture and animal production, but some agronomy experiments are carried out for the Colony's agronomist, including variety, manurial and cultivation trials.

PASTURE AND FODDER CROPS: Pasture and fodder experimental work

Table 3: Kidding Percentage of Goats at Sigatoka, 1950-52.

DATE OF KIDDING.		KIDDING PERCENTAGE.
June	1950	160
March	1951	113
August	1951	137
April	1952	136
September	1952	134

Table 4: Birthweight and Growth of Goats at Sigatoka.

TYPE.	BIRTHWEIGHT (lb.)	LIVEWEIGHT (lb.)			
		3 m.	6 m.	9 m.	12 m.
Fiji	4.6	20.6	28.0	34.5	45.0
Fiji x Angora	5.5	25.9	38.3	44.1	58.7

is carried out in co-operation with the agronomist and the biochemist. One phase is the trial of imported grasses and legumes under dry zone conditions, the species under trial coming from the Plant Introduction and Quarantine Station at Naduruloulou. A second phase is the trial of promising imported and local species under field conditions on both the alluvial and the hill soils.

DAIRY CATTLE: Breeding plans have been formulated for the dairy herds at both Koronivia and Sigatoka. Essentially the plan is to progeny-test imported European-type bulls that have been heat tolerance-tested overseas. At the same time basic information on growth, fertility, production and mortality of European-type dairy cattle in Fiji is being continuously collected.

The dairy cattle at both stations are being continuously heat tolerance-tested for more than one generation in order to ascertain whether there is a correlation between heat tolerance and production, whether the factors that make for heat tolerance are inherited, and to establish what variation there is in heat tolerance within and between breeds.

A major project has been completed using eight sets of identical twins, one of each set being maintained in New Zealand and one in Fiji. The object of this experiment was to ascertain the effect of the climatic environment in Fiji on European-type dairy stock. It has been shown that the climate directly affects both growth and the production of milk and butter-fat.

A second major project has been planned to compare the relative merits of indoor and outdoor feeding and management of European-type dairy cattle in Fiji. Unfortunately this experiment has not yet commenced owing to difficulties in the procurement of sets of identical twin calves.

Behaviour studies are also being made on European-type and Zebu-type cattle, and their first cross progeny. Other studies include a comparison of bucket rearing and suckling on a foster-mother with European-type calves, trials of the most suitable local concentrate feeds for calf rearing and milk production, and trials of methods of ameliorating climatic stress in productive dairy cows.

BEEF CATTLE: Breeding plans have been drawn up for maintaining two beef herds at the station.

A Zebu herd has been purchased and basic data on growth, fertility, and mortality are being collected. Data are also being collected on the growth rates and mortality of first-cross European-type x Zebu-type cattle.

Santa Gertrudis bulls imported from Australia in April will be used to grade-up local beef cattle. Data on growth, fertility, and mortality will be collected from all co-operating farmers and from the station herd.

PIGS: Breeding plans have been formulated for the Large White, Berkshire and Tamworth breeds. Boars, both locally-bred and imported, are being progeny-tested. The value of first and second-cross pigs for fattening purposes is being evaluated. Data are being assembled on fertility, fecundity, growth, carcass conformation and mortality.

A series of feeding trials has been commenced with the aim of: (a) Making up a ration of both imported and locally-grown feeds that will give optimal growth under Fiji conditions; (b) ascertaining the possibility of obtaining local supplies of animal protein feeds; (c) ascertaining how far animal protein feeds can be replaced by plant proteins; and (d) gaining information on the feeding value of all useful local pig feeds.

A feeding trial has also been commenced to ascertain the most suitable ration for baby pigs kept under local conditions from two weeks of age to weaning.

GOATS: Local Fiji does are being crossed with grade Angora and pure-bred Saanen goats. Data on fertility, fecundity, mortality, and growth of the crossbreds are being collected.

A project on the mineral nutrition of local goats on the hill grazings has been almost completed. Goats are being drenched with a complete mineral mixture in order to ascertain whether they are deficient in any particular mineral.

MISCELLANEOUS: A large number of minor problems are continuously investigated, most of them being concerned with the day-to-day management of the station's stock or pastures. Examples are the possibility of using surplus fodder in the wet season for making silage to be fed during the dry season, the possibility of making tapioca silage for pig feeding, evaluating the most suitable and economic methods of fencing, and comparing methods of castration.

Acknowledgement: This article is published by kind permission of the Director of Agriculture, Fiji.

Gathering Ipomoea reptans from the fish pond. This aquatic plant is not only a useful green feed for pigs; it is also a palatable vegetable for human consumption.

Pond Culture Of Tilapia

Annual yields from ponds of over one ton per acre have been recorded of Tilapia, an easily-bred edible fish that thrives equally well in fresh, brackish, or salt water.

By H. VAN PEL

Two specimens of Tilapia mossambica.

FISH farming is practised in many countries, and is a very ancient art in some areas. In the last 25 years it has become increasingly popular in tropical countries. Since the last war, it has been stimulated by a number of Governments and, where the techniques were not known, specialists have sometimes been engaged to teach them.

For various reasons, not all attempts at fish culture have been successful. These included the introduction of species that were unsuitable because they were either predatory or incapable of acclimatization in the locality chosen, and insufficient knowledge of proper farming methods.

Tilapia mossambica Peters seems to be an answer to the first of these difficulties. This is an entirely harmless fish, and it seems adaptable to a very wide range of climates and conditions. Other species of Tilapia are also used in fish farming, mostly in Africa, but this article will deal only with the abovementioned species.

First Pacific Appearance

The Tilapia is an African fish and belongs to the same group (Cichlid) as the Perch. There is no record of its introduction into Java, but it was found there in 1939. From this point it has spread to many Asian countries. It first appeared in the South Pacific in January, 1954, in Fiji, where it was introduced from Singapore. Recently it was introduced into Guam from the Philippines.

While it is not generally considered a first-class food fish, it contains few bones and is excellent for human consumption. It is sometimes raised for pig food.

Tilapia is about the easiest fish to raise in the tropics, even by unskilled fish farmers. It thrives in fresh and brackish water provided the pH is suitable.

The following will give an idea of their capacities of resistance: I took ten Tilapia from Fiji to Nouméa by air in a one-gallon (4.5-litre) glass jar, without any special provision for aeration, etc When I received them, they had already spent two days in the jar, yet all but two reached Nouméa in good condition. A large earthenware vessel has been their home since.

But that is not all. These fish had been born in fresh water. I brought the water in the vessel to a salinity of 20 parts per thousand by gradual stages, and then changed it in one stage back to fresh water again. Then I increased the salinity again in three stages to 35 parts per thousand, giving water of the same salinity as the ocean. Thus, it cannot be claimed that Tilapia is not a sturdy fish.

Commercial production of fish species sensitive to environment changes would be very difficult for unskilled farmers. Another point in favour of Tilapia is that one need not worry about fry. They attain maturity at about four months, and are able to reproduce all the year round at intervals of from two to three months, in both fresh and brackish water. They have also been observed to breed in really salty water (approximately 35 parts per thousand). One pair of adult fish may produce as many as 10,000 fry in a year.

High Yields

As for yield, productions of over one ton per acre per year have been recorded from cultivation ponds. These are greatly in excess of those obtained in Europe with carp or other fishes of the temperate zone. In nearly all cases, however, these high yields have been due to the presence of enormous quantities of "trash" (small fish of unmarketable size), fry and fingerlings resulting from unrestricted breeding with its attendant degeneration of the population. This creates no difficulty where the fish is intended for pig food. For human consumption, however, one good-sized fish is preferable to many small ones. It is therefore preferable to use only good fry from adult genitors.

Male Tilapias grow larger and heavier than the females, so that whenever possible it is advisable to raise only males for consumption. It is obvious that fish farmers can perform only a quick examination before separating the sexes.

External differences can fortunately be observed: the tail, fins, back and breast are of a darker reddish colour in the male than in the female, and this colouring also covers a greater surface. In addition, the back of the male is darker and its mouth broader than that of the female. These differences can be observed from the fingerling stage on. The validity of this sexing method has been checked by the author. Upon dissecting a number of Tilapia selected by this simple technique, the results were found to be 100% correct.

In order to permit the selection of fish, the ponds must be so arranged that the farmer can regulate the flow of water into and out of his ponds, with the help of sluices, monks or other devices, in order to control the water level. Otherwise it is the fish which manages the farmer, and not the other way around.

Tilapia is at home in ditches, swamps, reservoirs, large and small ponds and even rice paddies. However, waters already containing predatory fish are unsuitable.

In order to undertake commercial fish farming, one needs proper ponds. The

first requirement is that the bottom should not be porous, and a good water supply must be available. The supply should be capable of raising the level at least four inches in twenty-four hours, calculated from mid-water level. The draining arrangements should be such that the pond can be drained out in one day.

I do not propose to elaborate in this short article on the construction of ponds, since much depends on the particular circumstances of the proposed site: slope of the ground, tidal influences, etc. The South Pacific Commission will be glad to supply further information to those interested in building ponds, if full details about site, water supply, production required, general situation, etc., are provided.

A properly-built pond will provide enough food for the planned quantity of Tilapia if fertilized, say, with the effluent from a piggery, or with manure. This promotes the growth and multiplication of small aquatic plants and animals, the plankton, on which the fish feed. The quantity of manure to be used depends on several factors, but two imperial gallons (nine litres) of cow dung per rood of surface (0.1 hectare) per week is a safe quantity in the beginning. The colour of the water indicates whether fertilization is adequate or not. Once it has become a soupy green, applications of manure should be spaced out in order to keep it at the same stage.

If the pond does not produce enough plankton, additional food such as rice, bran, coconut meal, kitchen leftovers such as cooked rice, bread, etc., can be given, although when the fish are still at the fry and fingerling stages, these foods should be ground fine. One to two percent of the estimated weight of the fish should be enough daily. Tilapias also feed on insects, larvae and worms.

The stocking rate for a pond depends on its surface and depth, and on the amount of food available for it. Overstocking is undesirable, since the growth rate of the fish is thereby reduced. Under favourable conditions, with a fertilized pond, a yield of 1 lb. of fish for each 64 c. ft. (one kg. for each $4m.^3$) of water can be expected in a pond where depths range from 1½ to 3 feet (0.50 to 1.00 metre). In unfertilized ponds, without any additional food, the yield should be around 1 lb. of fish per 160 c. ft. (1 kg. per $10m.^3$) of water. In such ponds the depth should not exceed 1½ feet (0.50 metre).

When a fishpond is being stocked its carrying capacity in numbers and weight of fish must be assessed. For instance, a fertilized pond may carry, for each 40 c. ft. of water, one fish weighing 10 oz., or ten fish weighing 1 oz. each (one fish of 250 grammes or ten fish of 25 grammes for each cubic metre). An average mortality of 20% should be allowed for.

These data are valid only for raising *Tilapia mossambica*, and only up to a length of 8 inches (20 cms.). In fact, it is not economical to carry the effort further and raise larger fish since, from that point on, the weight gain becomes lower for a given amount of food.

A great many physical, biological and chemical factors play a part in fish farming, but they fall outside the scope of this article, which is especially intended for those who want to make a start in fish cultivation.

The discussions in progress. Left to right: Mr. J. O. Smith, Mr. Harbhajan Singh, Mr. J. F. Miles, Mr. R. M. Moore, Mr. R. Hancock, Mr. W. Hartley, Dr. A. H. J. Kroon, Mr. C. O. Erlanson, Mr. J. F. Barrau, Mr. G. P. Keleny, Mr. B. E. V. Parham, Dr. E. Phillis.

PLANT COLLECTION AND INTRODUCTION IN THE PACIFIC—Expert Discussions At Canberra

PLANT introduction is not new to the islands of the South Pacific. When, centuries ago, the Polynesians entered the region, they brought with them the plants which still provide their main food crops — yams, taro, breadfruit and bananas. With the Europeans came rice, maize, the pineapple and many other plants which were new to the region. Some of them, such as cocoa and coffee, are important sources of export income today.

Governments, missions and private citizens, all played a part in this enrichment of the flora of the islands, but in more recent years territorial departments of agriculture have been the chief agencies of plant introduction. At present the main stations are at Laloki, near Port Moresby, which serves the territory of Papua and New Guinea, and at Naduruloulou near Suva, which serves Fiji and, with the support of the South Pacific Commission, is acting more and more as a central station for other territories.

In order to plan a future programme of plant introduction for the islands, the South Pacific Commission held consultations at Canberra from May 2-7 last. The Commonwealth Scientific and Industrial Research Organization made available full facilities for the holding of the meeting, and Officers of the Organization made a valuable contribution to the discussions. The Principal Plant Introduction Officer of C.S.I.R.O., Mr. William Hartley, was Chairman of the meeting.

The consultations, which were arranged by the Commission, were held under the chairmanship of Mr. W. Hartley, Principal Plant Introduction Officer, C.S.I.R.O. Those attending were Mr. Carl L. Erlanson from the Plant Introduction Section of the U.S. Department of Agriculture, and a leading world authority in this field; Mr. B. E. V. Parham, Deputy Director of Agriculture, Fiji, who has been associated with the development of the Naduruloulou Plant Introduction and Quarantine Station; Mr. G. P. Keleny, Plant Introduction Officer of the Papua and New Guinea Department of Agriculture, Stock and Fisheries; Mr. J. F. Miles, Principal Plant Introduction Officer for Queensland and Northern Territory, and Dr. E. Phillis, from the Land Research and Regional Survey Section of C.S.I.R.O.; Mr. Harbhajan Singh of the Indian Agricultural Research Institute; and the Commission's Executive Officer for Economic Development, Dr. A. H. J. Kroon, and Technical Officer, Subsistence Agriculture, Mr. J. Barrau.

The consultations benefited much from the presence of Mr. Carl O. Erlanson, who explained the way in which plant introduction is organized in the United States and gave an account of the lines of research upon which the Federal Service is concentrating at the present time, in collaboration with the agencies of the State governments. For example, in recent years hundreds of varieties of bamboo have been collected and tested in the search for an alternative to forest trees in the manufacture of paper pulp. Satisfactory results have been obtained and the most suitable varieties are being propagated in preparation for the day when the United States will no longer be able to meet its

huge demands for paper pulp from traditional sources.

Territorial Activities In The Pacific

The Canberra meeting had before it statements submitted by the territories of the South Pacific region regarding their plant introduction activities and requirements, together with working papers prepared under the direction of the S.P.C.'s Executive Officer for Economic Development, Dr. A. H. J. Kroon. The officers responsible for the conduct of the two main plant introduction stations in the region, Mr. G. P. Keleny from Papua and New Guinea, and Mr. B. E. V. Parham from Fiji, took part in the discussions.

The meeting agreed that the work of the two main introduction stations should be continued and extended. In addition, a special examination was made of the requirements of coral atolls. The possibilities of these islands are strictly limited and as yet there is no agricultural experiment station dealing with their problems in any of the territories.

Objectives were formulated for introduction policy in regard to each group of plants with economic importance or economic possibilities in the region—beverage plants, fibres, oil plants, spices, fruits and nuts, cereals, pasture grasses, traditional subsistence crops, and European vegetables. Some of the conclusions and recommendations of the meeting are given briefly below.

Conclusions And Recommendations

Coffee varieties at present in the region would be improved by introductions from outside the region and new strains can be obtained from Indonesia and Florida. Precautions will have to be taken against bringing in diseases and the imported plants will have to be grown in quarantine initially.

Bamboo and rattan are being used for house and furniture construction and for handicrafts in the islands, and they have good future possibilities. New uses for bamboo are being developed. For instance, a method has been found in the United States of making aluminium joints which are connected to the bamboo by infra-red ray treatment. This new technique is permitting increased use of bamboo where light structural material is required. Some varieties of bamboo exist in the South Pacific but the plant is not as widely grown as in other comparable regions. Useful varieties can be obtained from outside sources, such as existing collections in Indonesia and Puerto Rica. Owing to the difficulties of transport, a number of collections of bamboo will have to be maintained in various parts of the region.

Pepper is suitable for small-scale collections as a subsidiary cash crop and is arousing growing interest in the South Pacific. Introduction and selection work needs to aim at achieving greater uniformity in fruiting and maturing and resistance to diseases.

Tropical fruits and nuts offer opportunities for development, both as cash crops and food crops, and plant introduction can contribute much to their improvement. There is an important need to establish reservoirs of potentially useful material in the South Pacific. The principal internal sources from which supplies can be sought are Florida, Hawaii, Indonesia, and Malaya.

In the case of peanuts, rice, yams and taros, the quality of stocks already present in the islands is high and an important aspect of plant introduction work should be the inter-territorial exchange of outstanding varieties. Maize and sorghum, however, are in need of improvement and promising varieties should be introduced from outside the region.

It is evident that areas with rich native and introduced floras, such as India, Central and South America, and South-East Asia, could offer much of value to the South Pacific. Experience has shown that the supply of only small amounts of these large stores of materials can be arranged through correspondence, and plant collecting work needs to be undertaken in other parts of the world in the interests of the islands. Fortunately, however, costly plant exploring expeditions will not be necessary, for much high-value material is available in existing collections at agricultural institutions in tropical countries.

Later in the year the South Pacific Commission will consider what action should be taken to implement the proposals which were made at the Canberra consultations on plant introduction.

Salt-Making By Solar Evaporation

(Continued from Page 21)

sulphide, calcium carbonate and most of the calcium sulphate contained in the water precipitate. This means that the less desirable salts are eliminated in Pond C.

As soon as the lye reaches a concentration of 27° Baumé it should be transferred to the crystallization tables, via the supply pipes. At this degree of concentration the sodium chloride (NaCl) starts crystallizing, a process which continues on the tables until a density of 32° Baumé is reached. At this point, most of the NaCl is crystallized, and the remaining lye, called "bitter lye", contains mainly calcium and magnesium chlorides. This lye must be drained off.

When the tables are used for the first time, two runs of concentrated lye should be brought to the table before any salt is scraped off. Thus a clean, sturdy layer of salt is formed on the surface of the tables, and it is then possible to gather beautiful white salt from subsequent runs.

By exercising due care, this method can produce salt with 95% to 97% sodium chloride content. Such a grade of salt is excellent for fish preservation. It is normally possible to harvest about 135 tons of salt from a pond system such as the one illustrated, in a five-month season. During the wet season, parts of the salt ponds are often used for raising fish.

School Journals In Polynesian

EIGHT years ago the School Publications Branch of the New Zealand Education Department commenced a work of major importance in island education: the production for the Department of Island Territories of school journals in the local dialects of Polynesian spoken in three out of its four Pacific groups—Western Samoa, the Cook Islands and Niue.

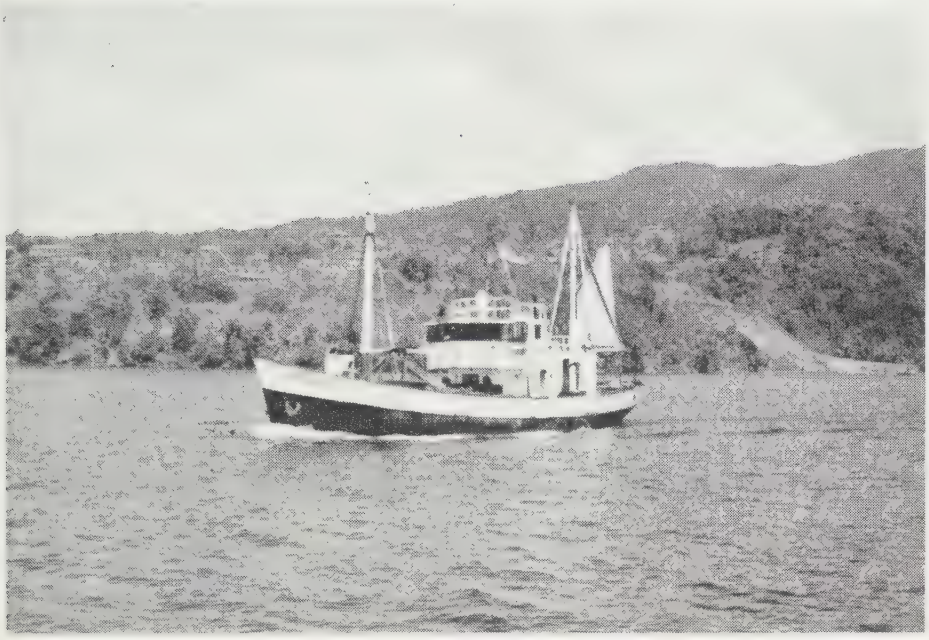
Well illustrated and beautifully produced, these journals, *Tusitala mo A'oga Samoa, Te Tuatua Apii o te Kuki Airani,* and *Tohi Tala ma e tau Aoga Niue,* have continued to set a standard which it would be hard to surpass. It would be difficult to say whether their contents are more appreciated by the school children or their parents. If there is a criticism, it is the dearth of local material: but for this the islanders themselves must be held culpable, for even after eight years of publication only a bare trickle of manuscripts is forthcoming from the territories.

Since 1951 the School Publications Branch have also been publishing small pamphlets twice a year for the children in the Dominion's remaining territory, the Tokelau Islands. But as Samoan is used in the Tokelau Government schools, the pamphlets were written in that language and used as local supplements to the Samoan School Journal.

In November last, however, it was possible to publish the first printed material ever to appear in the Tokelau dialect itself: a series of articles prepared by Peato, a Tokelau islander, who was the territorial representative during the visit of Queen Elizabeth to New Zealand.

This new venture, *Tala mo Aoga i Tokelau,* has been made possible largely owing to the untiring efforts of Father J. McDonald, a missionary in the Group for the past ten years, who has reduced the dialect to written form. Whether it will be possible to continue it will depend on the supply of suitable manuscripts, but with the encouragement of the newly-appointed Tokelau Islands Officer, Mr. R. Pearless, and the expert help of Father McDonald, it is hoped that this will be maintained. While everyone in the Tokelau Group can read the Samoan language, it is felt that they will appreciate this recognition of their separate identity.

Fisheries Development in Netherlands New Guinea



A progress report on an exploratory project designed to assess the fisheries resources of Netherlands New Guinea.

By D. C. ZWOLLO*

The North Sea trawler "De Goede Hoop", purchased by the Administration of Netherlands New Guinea to investigate the fisheries resources of the territory.

THE importance of fish as an article of diet in Netherlands New Guinea requires no new emphasis. Both the coastal population and the people of the interior obtain most of their animal proteins from fish. Recent investigations by nutritionists have proved, however, that in several areas a protein deficiency exists. To improve this situation it is necessary, along with other measures, to develop the fisheries—both marine and inland—in the territory in order to produce more animal protein.

The Government's programme for fisheries in the past few years has been primarily concerned with effecting a stocktaking of the existing situation. This included the location of the actual fishing grounds, assessment of economically-important fish stocks, and determination of the fishing seasons and of the most suitable types of fishing equipment.

A scheme was drawn up for the purchase of two sea-going vessels[1] and the recruitment of expert skippers for their operation. Thus it was possible to carry out the stocktaking and at the same time train native crews in handling modern ships and the use of new fishing gear and methods.

One of the vessels purchased is the 70 ft., 150 h.p. North Sea trawl-cutter *De Goede Hoop*, equipped with refrigeration, echo-sounder and fish detector. Since arriving in Netherlands New Guinea in July, 1953, this ship has been constantly in operation, and although the actual fishing time has been relatively small, ship and crew have been busily engaged.

Although much has been accomplished, shore facilities still leave much to be desired, and as a result the average turn-around time per trip for the vessels has been too long. Once servicing of the ships has become more efficient, the turn-around time will be much less.

Since the project is an exploratory one initially, much time has been spent on research. As most of the off-shore waters have never been exploited before, no data were available; moreover, the charts of these waters often proved to be unreliable in such respects as the nature of the bottom, depth indications, and location of reefs and obstacles.

Thus, the nets were very often damaged and time was lost in repair work. Without the help of the echo-sounder and fish-detector, the work would have been still more difficult. These instruments proved to be indispensable both for nautical and fishing purposes.

Trawling operations were carried out with a hempen otter trawl of the design commonly used by Dutch North Sea cutters. After initial trials, some modifications to ground ropes, otter boards and floats appeared necessary to adjust the gear to the nature of the sea bottom and the occurrence of the fish at a higher level than that for which the net was designed.

Experiments proved that the best trawling results were obtained with the Vigneron Dahl patent. In addition, a cotton shrimp trawl was used wherever the presence of shrimp was indicated from the trawl catches.

Results of the exploratory operations varied from one fishing ground to another. Trawling was started in the middle of 1953, west of the mouth of the Mamberamo River, along the North Coast. Here the bottom proved to be suitable for trawling over a fairly extensive area, with depths varying from 6 to 16 fathoms.

The hour-catches were not high, but the fish caught was of very good quality. In August and September, 1954, during a second fishing experiment in this area, the hour-catches were nearly twice as high as in 1953.

Trawling near Sorong and the MacCluer Gulf, carried out in the first half of 1954, was less successful on account of the irregularity of the bottom. Also, bottom-dwelling fish proved to be scarce beyond the six-fathom depth line. In the coastal waters inside this depth line, where a layer of mud covers the bottom, better results were obtained.

The most successful trawling was carried out in the Kaboei and Majalibit Bays of the large island of Waigeo. In the former bay, average hour-catches of nearly a ton of good quality fish were obtained. Although the trawlable area is relatively small, these grounds must be considered very important for establishing a trawl fishery with small craft by native fishing co-operatives.

Concluding, it may be said that the results thus far, though not always satisfactory from a viewpoint of establishing a large-scale trawlfishery, were very encouraging as a basis for a future expan-

* Mr. Zwollo is Head of the Fisheries Division of the Department of Agriculture and Fisheries, Government of Netherlands New Guinea.

1 See SPC **Quarterly Bulletin**, Vol. 4, No. 4, Oct., 1954.

After the catch is hauled on board the trawl net is opened to empty out the fish for sorting and storage below.

sion and development of the native fishing industry.

It must be stressed that actually only a small area of the potential trawling grounds around Netherlands New Guinea have been covered thus far. Moreover, the time spent on each trawling ground was small, and it will be necessary to continue the work in other seasons and other years to be able to arrive at definite conclusions about the possibilities in each area.

One of the encouraging aspects of the trawling operations was that the autochthonous crews adjusted themselves very quickly to the technical problems of the new fishing method.

As the shallower areas along the coast have definitely proved relatively rich in "bottom" fish, trawling with small vessels could probably be successfully introduced in the indigenous fishing industry. There is the consideration that small vessels will present the native fishermen with less problems of psychological and technical adjustment, and also will involve less capital and less financial risk.

Therefore, introduction of small trawl-type vessels equipped for a few additional fishing methods like trolling and gill-netting may make an important contribution to the overall fish production of Netherlands New Guinea.

Fisheries Officer Visits Cook Group

THE Commission's Fisheries Officer, Mr. H. van Pel, has just returned from the Cook Islands, where he spent some time investigating possible resources from the open sea, lagoon and inland fisheries.

During his visit to the Northern Cooks, Mr. van Pel organized and supervised the transfer of the black-lipped pearl oyster (*Pinctada margaritifera*) from Manihiki to Rakahanga.* The whole shipment of over 300 oysters arrived in very good condition, without loss. The Cook Islands Administration intends to make a similar transfer from Manihiki to Puka Puka, where the lagoon is also likely to prove suitable for the pearl oyster.

In Rarotonga Mr. van Pel supervised the construction of freshwater fish ponds in which *Tilapia mossambica* will be raised.** When the Fisheries Officer left Rarotonga, one pond was finished and a second was being dug. An order has been placed with the Department of Agriculture, Fiji, for 100 Tilapia fingerlings for stocking these ponds.

Possibilities for fish culture in ponds were also found in other islands of the group, provided fry is available to stock them. In about four months' time, the Cook Islands Department of Agriculture will be able to distribute such fry.

* See also the article, **Rehabilitation of Pearl Oyster Beds in French Oceania**, appearing elsewhere in this issue.

** A description of this fish and farming methods applying to it will be found elsewhere in this issue.

PICTURE CREDITS

Acknowledgment is made for photographs in this issue, as follows: Page 6 (Research Council Meeting), F. Dunn, Nouméa; pages 19, 27-29, Fiji Official Photos; pages 22-23, Sylvain, Tahiti; page 31, Australian Official Photo; pages 33-34, Netherlands Information Service.

Technical Information on Filariasis and Elephantiasis

THE assembling and maintaining of a body of technical information on filariasis and elephantiasis is an important activity in the Commission's work programme. This information, which is essential for the carrying out and extension of research, can also be made available to research workers in South Pacific territories.

In order to fulfil this twofold purpose, a practical and simple method of classification has been followed. Material at present available includes:

(1) Microfilm mainly received from the Army Medical Library, Washington, D.C. (U.S.A.) and from the "Centre de Documentation de Médecine Tropicale, Ecole d'Application du Service de Santé des Troupes Coloniales", Marseilles, France;

(2) reprints submitted by a number of authors; and

(3) photostats obtained from various sources.

On arrival, each microfilm is slipped into a cellophane envelope with a paper strip bearing the title attached. The microfilm is numbered according to the order of receipt and placed in a special file which can hold 500 documents. A card is made out giving the name of the author, the title of the article, and the serial number of the microfilm, and it is filed alphabetically under the author's name.

Reprints, photostats, reports, etc., are placed in envelopes and filed using the same method as for microfilms.

An annotated bibliography on filariasis and elephantiasis is at present in preparation, including the following sections: epidemiology, parasitology, entomology, pathological examination, treatment and control.

The section dealing with the epidemiology of elephantiasis and filariasis in the South Pacific has already been issued (Technical Paper No. 65, August 1954). Entries are listed in chronological order. Asterisks indicate the material available at Commission headquarters, thus obviating the need for publishing separate bibliographical lists.

Over 1,500 documents are at present assembled. They are available on loan without charge to Health Departments and research workers in the South Pacific. Requests should be addressed to the Secretary-General, South Pacific Commission, Nouméa, New Caledonia. Regular ordering of microfilm and active correspondence with filariasis specialists throughout the world, will afford the South Pacific Commission in the very near future the means of obtaining a complete filariasis and elephantiasis archive.

—*S. MONLAU.*

QUARTERLY READING LIST No. 15

A bibliography of publications relating to social development in the South Pacific.

THIS Reading List represents an attempt to note every item to appear in the field of Social Development in the South Pacific during the quarter; the entries are drawn from over 100 periodicals which are regularly examined, as well as from bibliographies, publishers' notices and similar material. Publications of the South Pacific Commission have not been indexed. Items marked with an asterisk have not been seen in the Social Development Section. The Executive Officer for Social Development, G.P.O. Box 5254, Sydney, will be glad to obtain for any metropolitan or territorial Government copies of items listed.

SOUTH PACIFIC — GENERAL

Anthropology

(1) BELSHAW, C. S.: The cultural milieu of the entrepreneur: a critical essay. *Explorations in Entrepreneurial History*, vol. 7, no. 3, February, 1955. pp. 146-163, bibl. Examples drawn mainly from Melanesia.

(2) KEESING, F. M.: Mander's "Some dependent peoples of the South Pacific": a review. *Pacific Historical Review*, vol. 24, no. 1, February, 1955. pp. 86-88.

(3) OLIVER, D. L.: Case studies in colonial development: Papua-New Guinea, Fiji and Western Samoa. *Human Organization*, vol. 13, no. 1, Spring, 1954. pp. 38-40. A review of Stanner's "The South Seas in Transition."

(4) STANNER, W. E.: A reply to C. S. Belshaw's review of "The South Seas in Transition". *Man*, vol. 54, no. 178, July, 1954. p. 116.

History

(5) DAVIDSON, J. W.: The study of Pacific history: an Inaugural Lecture delivered at Canberra on 25 November, 1954. Canberra, the Australian National University, 1955. 26 p.

(6) SHELTON, R. A.: Explorers' maps: VIII —The Spanish in the Pacific. *Geographical Magazine*, vol. 27, no. 11, March, 1955. pp. 543-556, illus. Cartographic record of exploration in the Pacific from the 16th to the 18th Century, by the Superintendent of the Map Room of the British Museum.

Missions

(7) EASTMAN, G. H.: Koskinen's "Missionary influence as a political factor in the Pacific Islands": a review. *International Review of Missions*, vol. 44, no. 174, April, 1955. pp. 225-227.

SOUTH PACIFIC COMMISSION

(8) Review of the South Pacific Commission. *Current Notes on International Affairs*, vol. 26, no. 1, January, 1955. pp. 18-26.

MELANESIA

Anthropology

(9) OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE MER: L'Institut Francais d'Océanie, Nouméa, New Caledonia, Nouméa. l'Institut, 1955. 28 p. *processed*. Section VII (pp. 20-24) reports on the current research of the Institute's Ethnologist, M. I. Guiart, and gives a list of his recent publications.

(10) PIDDINGTON, R.: Elkin's "Social Anthropology in Melanesia": a review. *Journal of the Polynesian Society*, vol. 63, nos. 3 and 4, September-December, 1954. pp. 276-277.

Linguistics

(11) BURGMANN, A.: Karl Neuhaus' Grammatik des Lir (Melanesien). *Anthropos*, vol. 49. nos. 5-6, 1954. pp. 1089-1093.

(12) HALL, R. A.: The provision of literature in Neo-Melanesian. *South Pacific*, vol. 7, no. 13, November-December, 1954. pp. 942-944.

POLYNESIA

Anthropology

(13) GOODENOUGH, W. H.: A problem in Malayo-Polynesian social organization. *American Anthropologist*, vol. 57, no. 1, February, 1955. pp. 71-83.

(14) LAGUESSE, J.: Migration polynésienne moderne. *Bulletin de la Société d'Etudes Océaniennes*, vol. 9, no. 8, December, 1954. pp. 354-357. A drift voyage in a canoe from Easter Island to Reao in French Oceania.

(15) NAYACAKALOU, R. R.: Keesing's "Social Anthropology in Polynesia": a review. *Journal of the Polynesian Society*, vol. 63, nos. 3 and 4, September-December, 1954. pp. 274-275.

COOK ISLANDS

History

(16) GILSON, R. P.: The foundations of Cook Islands land policy. *South Pacific*, vol. 7, no. 13, November-December, 1954. pp. 948-955.

FIJI

Anthropology

(17) TIPPETT, A. R.: Anthropological research and the Fijian people. *International Review of Missions*, vol. 44, no. 174, April, 1955. pp. 212-219. Review article of Roth's "Fijian Way of Life" and Hocart's "The Northern States of Fiji."

(18) WALSH, R. J., and KOOPTZOFF, O.: Blood-groups of some non-Europeans in Fiji. *Oceania*, vol. 25, nos. 1-2, September-December, 1954. pp. 68-73.

Community Development

(19) Hayden's "Moturiki: a pilot project in community development": a review. *Oversea Education*, vol. 26, no. 4, January, 1955. pp. 170-171.

(20) SNOW, P.: Hayden's "Moturiki: a pilot project in community development": a review. *Man*, vol. 54, no. 201, August, 1954. p. 130.

(21) TIPPETT, A. R.: Hayden's "Moturiki: a pilot project in community development": a review. *International Review of Missions*, vol. 44, no. 174, April, 1955. pp. 229-231.

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(22) TIPPETT, A. R.: The Christian: Fiji, 1835-67. Suva, Methodist Church of Fiji, 1955. pp. 43, illus. The causes underlying the rapid spread of Christianity in Fiji, beyond those usually put forward, during the foundation period of the Church in Fiji.

FRENCH OCEANIA

Archaeology

(23) MARSHALL, D. S.: The Seabrook adze. *Journal of the Polynesian Society*, vol. 63, nos. 3 and 4, September-December, 1954. pp. 251-252, illus.

Anthropology

(24) JACQUIER, H.: Compte-rendu de la fete du folklore au marae de Arahurahu. *Bulletin de la Société d'Etudes Océaniennes*, vol. 9, no. 8, December, 1954, pp. 327-335, illus.

(25) Legende du Marae Arahurahu, translated from the Tahitian by A. Drollet. *Bulletin de la Société d'Etudes Océaniennes*, vol. 9, no. 8, December, 1954. pp. 336-345.

(26) TERIIEROO, E.: Légende de Turi. *Bulletin de la Société d'Etudes Océaniennes*, vol. 9, no. 8, December, 1954. pp. 346-349. Translated by Rev-Lescure.

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(27) REY-LESCURE, J.: Notes sur la Toponymie des E.F.O. *Bulletin de la Société d'Etudes Océaniennes*, vol. 9, no. 8, Decembre, 1954. pp. 350-353.

GUAM

Museums

(28) BAIRD, J. H.: The Guam Museum. *Journal of the Polynesian Society*, vol. 63, nos. 3 and 4. September-December, 1954. pp. 253-254.

NETHERLANDS NEW GUINEA

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(29) FEUILLETAU de BRUIJN, W. K.: Goederenruil en handel bij de primitieve stammen van Nieuw-Guinea. *Tijdschrift Nieuw-Guinea*, vol. 14, no. 3, September, 1953. pp. 72-83; vol. 14, no. 6, March, 1954. pp. 168-175; vol. 15, no. 1, May, 1954. pp. 7-12; vol. 15, no. 2, July, 1954. pp. 39-45; vol. 15, no. 3, September, 1954; pp. 72-74; vol. 15, no. 4, December, 1954 pp. 97-99; vol. 15, no. 5, January, 1955. pp. 129-139.

(30) KAMMA, F. C.: De Messiaanse Koreri bewegingen in het Biaks—Numfoorse cultuurgebied. The Hague, Voorhoeve, 1954, vi, 250 pp., map, bibliog.; English summary.

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(31) Bibliographie van Nieuw-Guinea. *Tijdschrift Nieuw-Guinea*, vol. 15, no. 5, January, 1955. pp. 159-160.

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(32) Nieuw-Guinea. *Landbouwkundig Tijdschrift*, December, 1954. 71 pp. Contributions include Rural Development in New Guinea by J. P. K. van Echoud and Lines of Agrarian Development in New Guinea by J. A. van Beukering.

Government and Administration

(33) The West New Guinea Question. *Current Notes on International Affairs*, vol. 26, no. 1, January, 1955. pp. 12-17.

Housing

(34) TICHELMAN, G. L.: Huizenbouw op Nieuw-Guinea. *Tijdschrift Nieuw-Guinea*, vol. 15, no. 5, January, 1955. pp. 140-146.

Linguistics

(35) COWAN, H. K.: Variability in New Guinea languages. *Oceania*, vol. 25, no. 3, March, 1955. pp. 208-215.

NEW CALEDONIA

Anthropology

(36) GUIART, J.: L'Organisation sociale et coutumière de la population autochtone de Nouvelle-Caledonie. Nouméa, Institut Français d'Océanie, 1954, 29 pp. processed.

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(37) EASTMAN, G. H.: Leenhardt's "De la mort à la vie: l'Evangile en Nouvelle-Calédonie": a review. *International Review of Missions*, vol. 44, no. 174, April, 1955. pp. 228-229.

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(38) BELSHAW, C. S.: In search of wealth: a study of the emergence of commercial operations in the Melanesian society of Southeastern Papua. American Anthropological Association. Memoir No. 80, February, 1955. x, 88 p., illus., maps.

(39) BERNDT, R. M.: Kamano, Jate, Usurufa, and fore kinship of the Eastern Highlands of New Guinea: a preliminary account. *Oceania*, vol. 25, nos. 1-2, September-December, 1954. pp. 23-53; vol. 25, no. 3, March, 1955. pp. 156-187.

(40) BURRIDGE, K. O. L.: Racial tension in Manam. *South Pacific*, vol. 7, no. 13, November-December, 1954. pp. 932-938.

(41) GRENFELL PRICE, A.: Dordick's "Climate and Work in Australian New Guinea": a review. *Geographical Review*, vol. 45, no. 1, January, 1955. pp. 121-123.

(42) LEACH, E. R.: A Trobriand Medusa. *Man*, vol. 54, no. 158, July, 1954. pp. 103-105, illus.

(43) LINDSAY, H. A.: The racial types of New Guinea. *Walkabout*, vol. 21, no. 3, March, 1955. pp. 10-13, illus., map.

(44) LUZBETAK, L. J.: The socio-religious significance of a New Guinea pig festival. *Anthropological Quarterly*, vol. 27, no. 1, July, 1954. pp. 59-80 (part 1); vol. 27, no. 2, October, 1954. pp. 102-128 (part 2).
(45) QUINLIVAN, P. J.: Afek of Telefomin: a fabulous story from New Guinea which led to a strange tragedy. *Oceania*, vol. 25, nos. 1-2, September-December, 1954. pp. 17-22.
(46) WALSH, R. J., KOOPTZOFF, O., DUNN, D., and SOHN, K. S.: The blood groups of some native inhabitants of the British Solomon Islands. *Oceania*, vol. 25, no. 3, March, 1955. pp. 194-197.

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(47) Bibliographie van Nieuw-Guinea. *Tijdschrift Nieuw-Guinea*, vol. 15, no. 5, January, 1955. pp. 159-160.

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(48) CARTER, J.: Highland frontier: a pictorial record of the eastern and western highlands of New Guinea. Port Moresby, Papuan prints, 1955. 37 p., illus.

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(49) BARSDELL, L. E.: Papua and New Guinea. *International Institute of Differing Civilizations*. Programmes and plans for rural development in tropical and sub-tropical countries. Record of the 28th Meeting held in The Hague, September, 1953. Brussels, the Institute, 1953. pp. 286-293, bibl.

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(50) BOISEN, F. N. and McNAMARA, V.: Vunamami: an experiment in rural education in a native village community. Port Moresby, Department of Education, 1954. pp. 33. *Papers on Education, No. 2, mimeographed.*
(51) Fashion Bilong New Guinea. *Current Affairs Bulletin*, vol. 15, no. 13, April 11th, 1955. pp. 195-208, map. Post-war developments among the native people in the territory.

Linguistics

(52) COWAN, H. K.: Variability in New Guinea language. *Oceania*, vol. 25, no. 3, March, 1955. pp. 208-215.
(53) COWAN, H. K. J.: Ethnolinguistics and "Papuan" etymology. *Oceania*, vol. 25, nos. 1-2, September-December, 1954. pp. 54-60.
(54) HALL, R. A.: Hands off Pidgin English. Sydney, Pacific Publications, 1955. 142 pp., bibl., map. Discussion of the problems involved in the use of Pidgin in Papua and New Guinea. Includes sections on the nature and functions of the language, its structure, and prospects for its use in the future.

Missions

(55) MOLYNEUX, F.: Unique native industrial centre. *Walkabout*, vol. 21, no. 5, May, 1955. pp. 34-36, illus. The Kwato Mission of New Guinea and its work.

Research Programmes

(56) New Guinea research project: Nuffield and University of Sydney. *Oceania*, vol. 25, no. 3, March, 1955. p. 230. Grant for research in anthropology and medical research in the "new" regions of the Central Highlands of New Guinea.

TRUST TERRITORIES OF THE PACIFIC ISLANDS

Anthropology

(57) RIESENBERG, S. H. and FISCHER, J. L.: Some Ponapean Proverbs. *Journal of American Folklore*, vol. 68, no. 267, January-March, 1955. pp. 9-18.

Linguistics

(58) BURRUS, E. J.: Sauvitores' Grammar and Catechism in the Mariana (or Chamorro) language (1668). *Anthropos*, vol. 49, nos. 5-6, 1954. pp. 934-960.

Technical Publications in Social Development

The Commission's Executive Officer for Social Development maintains a small stock of technical publications which will be sent on request to specialist officers working in Pacific territories. Requests should be addressed to the Executive Officer at Box 5254, G.P.O., Sydney.

The service regularly includes such periodicals as *Community Development Bulletin, Fundamental Education—A Quarterly Bulletin, South Pacific* and *Pacific Islands Education*. Individual publications received recently and available under this service are:—

No. 168

Chain store management in the Philippines, by J. P. Lugrin. (Price Stabilization Corporation—PRISCO.) A report prepared for the Government of the Philippines by an expert appointed by the Technical Assistance Administration of the United Nations. 80 p., illus. Includes designs of store premises and equipment, warehouse organization, training of sales staff, etc.

No. 169

International Colonial Co-operation: principle and practice. Contents include: Colonial policy principles of co-operation between colonial powers (Regional organizations) and co-operation through the United Nations. 10 p.

No. 170

The Problem: to motivate, to teach, to train with audio-visual aids. Issued by the U.S. Department of State, Technical Co-operation Administration. A very well presented, illustrated booklet on the use of audio-visual aids in education. Includes a list of free sources of films, posters, etc., in the United States.

No. 171

Management and accounting for consumer co-operatives. Prepared jointly by the Staff of the British Guiana Co-operative Department, and the British Guiana Co-operative Union Ltd. 43 pp. Simple and straightforward instructions on keeping cashbooks, journals, ledgers, etc., stock control and balancing and checking accounts. Contains sample forms.

PRINCIPAL COMMISSION PUBLICATIONS

Publications issued by the South Pacific Commission include the following:—

- *SPC QUARTERLY BULLETIN:* This is an illustrated periodical, reporting progress in the economic, social and health fields, whether in Pacific territories, or by the Commission, or in other places comparable with and of interest to the tropical Pacific area.

  Annual Subscription ..... *8/- Stg.*

- *PACIFIC READING:* Details appear on page 13 of this issue.
- *TECHNICAL PAPERS:* These are technical reports on a wide range of subjects in the economic, social and health fields (list on outside back cover).
- *OFFICIAL RECORDS: Proceedings of Sessions of the South Pacific Commission* (First to Twelfth); *Annual Reports of the South Pacific Commission* (1948 to 1952); *Reports on the First and Second South Pacific Conferences; Progress Reports on Action Taken on the Resolutions of the First South Pacific Conference.*
- *EXPERT REPORTS:* The Oxford University Press is publishing a series of Expert Reports in book form for the Commission. Four have been issued to date:

  VOCATIONAL TRAINING IN THE SOUTH PACIFIC. By R. A. Derrick, M.B.E., A.M.I.S.E., F.R.G.S. Mr. Derrick's report consists of a survey of the facilities for professional and technical training in the whole of the South Pacific, and of recommendations for future development.
  Price in Australia ..... *30/-A.*

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PACIFIC READING

No. 10

JULY, 1955

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NOTES AND NEWS

Incorporation of "Pacific Reading" in "Quarterly Bulletin". This is the first issue of the *Quarterly Bulletin* that has included material previously published in *Pacific Reading*. The final issue of *Pacific Reading* as a separate periodical was that dated December, 1954.

Readers of *Pacific Reading* are reminded that where they have already paid their subscriptions in advance and are also subscribers to the *Quarterly Bulletin* their subscriptions will be extended for a period equivalent to their outstanding subscription to *Pacific Reading*. Subscribers to *Pacific Reading* who have not previously been subscribers to the *Quarterly Bulletin* will, commencing with this issue, receive the latter paper instead. Naturally, any subscriber who is not suited by these arrangements will be entitled to a refund of the outstanding portion of his subscription on application to the Secretary-General, South Pacific Commission, Nouméa, New Caledonia, or to G.P.O. Box 5254. Sydney, N.S.W., Australia.

New Staff. Mr. Charles Birchmeier has recently joined the Literature Bureau staff in Sydney. As a journalist he has had wide experience in the publishing world, and during the last five years was responsible for the editing and production of agricultural extension pamphlets and booklets issued by the N.S.W. Department of Agriculture.

Literature Bureau Publications. Messrs. Longmans, Green are publishing in association with the South Pacific Commission Literature Bureau, two books entitled *Across New Guinea* and *The Hiri*, and we hope that these will be ready before this issue of the *Quarterly Bulletin* goes to press; they have been attractively illustrated with black and white drawings. These books are the first two titles in the "Bonito Series". *Across New Guinea* deals with the first crossing of New Guinea from the Fly to the Sepik rivers by Champion and Karius; *The Hiri* relates the story of the old native trading expedition in which the Motu people from Port Moresby sailed each year in their *lakatoi* to the Gulf District in Papua. A traditional tale from Papua entitled *The Magic Pot* is now in the press; it is hoped that it will be produced with two-colour illustrations and cover. This will be the first title in the new "Coral Series". These books have

been designed for either adult or school reading and should prove useful as supplementary English readers at about 4th-6th year level. We hope that it will be possible to add further titles to both these series from time to time, and we shall welcome suggestions and manuscripts. It is intended that the "Bonito Series" should be devoted to books of a factual and historical nature with a Pacific background, and that the "Coral Series" should deal with legends and fiction from the islands. Another book expected shortly is *Food and The Work It Does,* which is to be published by Messrs. Macmillan in association with this Literature Bureau. This book has been simply written and profusely illustrated and should prove useful for schools and for work at village level.

Leaflets for Village Reading. Mention was made in issues 7, 8, and 9 of *Pacific Reading* of the production of a series of illustrated leaflets for village reading mainly in Melanesian areas. The most recent titles that have been produced are *Fruit Juice for Baby* and *Clean Water.* Specimen copies of these leaflets are available from this Bureau; larger quantities may be ordered at a cost of from £1 9s. 0d. a hundred depending on the quantity ordered. These two leaflets have been produced in a larger size than the earlier ones and it has been possible to employ bigger type and lettering for them. Copies of the three earlier leaflets entitled *Tina Protects Her Family, Milk for Rauna,* and *Clean Milk,* are still available from the Literature Bureau at a cost of from 16s. 8d. a hundred; larger quantities may be supplied at a lower price. Orders for 56,000 copies of these leaflets have now been received, and inquiries have been made which may result in the production of an additional 230,000 copies.

Experimental Book on Village Hygiene. The Literature Bureau hopes to have available for distribution shortly, an experimental book designed to demonstrate low-cost printing techniques. This book will be thirty-two pages in length and is entitled *Flies Are Your Enemy.* It tells, in story-form, the dangers of fly-infested villages, and the benefits that result from ridding villages of flies. Each left-hand page of the book will have a full-page illustration and on the right-hand page a text in simple English. Single specimen copies will be available free of charge on application to the Literature Bureau, and we shall gladly give details of production costs to anyone who is interested.

Pamphlets. In co-operation with, and on the behalf of, the Department of Health in Papua and New Guinea, two eight-page pamphlets are in the course of preparation. The pamphlets are entitled *Infant and Maternal Welfare Clinics* and *The Pregnant Woman* and have been attractively illustrated. The simple text and illustrations make the pamphlets suitable for village reading in Melanesian areas. It is hoped that these pamphlets will be ready soon, and specimen copies and further details will be then available from the Literature Bureau on application.

Silk Screen Printing. From time to time enquiries have been received about the use of silk screen printing which is becoming increasingly popular in the Pacific and rightly so, for it is simple and inexpensive, and can produce very attractive results. Several Pacific Islands now have their own silk screen printing facilities and others are known to be considering the purchase of the necessary equipment. The method is of course particularly suitable for poster work but may also be used successfully for book covers or illustrations, and if photographic stencils are used, very subtle and varied results may be obtained. The Public Relations Officer at Suva has made some extremely successful experiments in the different uses of screen printing, including reproductions of oil paintings.

Though it takes years of training and experience to reach the high standard set by Mr. Payne of the Public Relations Office, beginners may achieve satisfactory effects using lakron stencils and by experimenting with colours and registration.

A brief account of the process was published in *Pacific Reading* No. 4, September, 1953. Copies of this article may be obtained, on request, from the Executive Officer for Social Development, and any further assistance in the way of information or advice on purchasing equipment and supplies will gladly be given by the Social Development Section.

Current prices in Sydney for silk screens, inks, stencil papers, etc. are:

Screens: size 15″ x 10″ ..... 23/6d.
„ 13″ x 13″ 25/–
„ 16″ x 14″ 35/–
Squeegees: (handle and rubber roller) ..... 1s. an inch.
sizes 8½″ - 9″ squeegee for 15″ x 10″ screen.
11″-12″ „ „ 13″ x 13″ „
12″-13″ „ „ 16″ x 14″ „
Lakron paper: per sheet, 30″ x 40″ ..... 6/6d.
Stencil knives (with two blades) ..... 6/– each.
Lakron thinner ..... 18/10d. per gallon.
Textile colours: (available colours) red, scarlet, orange, blue, lemon, chrome yellow, white, mauve, light brown, chocolate, mustard.
Tins: 1 pint, 11/-. 1 quart, 22/-. ½ gallon, 42/4d. 1 gallon, 82/-.
Reduction paste: (for thinning colours) 8 oz. jars, 5s. each.

Though orthodox equipment may be ordered from Sydney, a great deal may be done with improvisation, if money is short and goods are unobtainable, and advice on this subject may be obtained on application to the Social Development Section.

Magnetic Sound Projectors. Mention has been made, in *Pacific Reading,* of these projectors, by which users may record their own sound tracks on magnetic striped film. Details of three well-known brands of magnetic projectors are now available in Australia: the Bell & Howell model, from Sixteen Millimetre Pty. Ltd., 49, Market Street, Sydney; the Ampro, from A.W.A., 47, York Street, Sydney, and the BTH, from Australian General Electric Pty. Ltd., 93-95, Clarence Street, Sydney. Prices are between £A.450 and £A.550. Magnetic striping (half stripe or full stripe) of films can now be done in Sydney by Kinelab Pty. Ltd. of 484, George Street, Sydney, at a price of 3d. per foot. Further information will be provided on application.

Australian Books Of The Year. The judges' decisions in the Third Annual Competition for the best "Books of the Year" published in Australia during 1954 have shown in a striking manner the high standard of the books being published by the Oxford University Press in association with the Commission.

The competition is sponsored by the Australian Book Publishers' Association to stimulate interest in the standard of Australian book printing and design, the task of the panel of judges being to assess the works submitted on their merits as examples of book design and production. The selection is made in two categories: General Books and School Textbooks.

In the previous year's competition one of the thirteen books in the final selection—chosen from an entry of sixty-one—was G. K. Roth's *Fijian Way of Life,* the publication of which was arranged through the Commission.

This year, despite the fact that entries were greater and

(Continued on page 46)

SOME THOUGHTS ABOUT ENGLISH BOOKS FOR THE PACIFIC

by CAMILLA WEDGWOOD

One of the results of the contact between Europeans and Natives in the Pacific has been a desire on the part of the latter to learn the language of their alien administration. The reasons for this are partly social, partly economic and partly political. In the territories administered by English-speaking metropolitan countries there is today a widespread and insistent demand for education, and primarily for schools in which the children shall be taught English. Many adults also are eager to learn English. For various reasons the administering authorities are interested in teaching English to their dependent peoples. There is therefore a growing need for reading material in English: to help the people to learn the language; to provide them with instruction in other subjects; to give them access to matters which concern or interest them; to provide them with recreational reading.

It is not as easy as has sometimes been assumed to prepare suitable material in English for those whose mother-tongue and whose cultural background are wholly different from the language and culture of Western Europe. There are three things which I believe to be of special importance in the preparation of such reading material: the type of English used; the content—both the subject matter and its presentation; the production.

Before setting out to produce any kind of reading matter an author must be clear in his mind as to the kind of people for whom he is writing, and the purpose for which he is writing. A difference must obviously be made between writing for adults, for children and for adolescents. A distinction must equally be made between books whose primary aim is to teach the language; those intended primarily for instruction in specific subjects; those intended primarily for extending the reader's intellectual horizon, for introducing new ideas and stimulating thought; those intended primarily for recreation. Those designed primarily for one purpose may legitimately serve the other purposes as well, but only if they do so without interfering with the main purpose. A glance at a number of English books prepared for the Native peoples of Africa and elsewhere, shows that sometimes too little thought has been given to these matters, and that for this reason some of the books fail in effectiveness.

LANGUAGE

(1) *Vocabulary.*

It is a common illusion among English-speaking people that it is easy to produce a piece of prose in simple English which can be understood by someone who is learning the language. How great an illusion this is becomes apparent when one studies some of their productions. The *Papua and New Guinea Villager* and the *Pacific World* are both intended to be read by Natives with a limited knowledge of English, but the vocabulary used and the construction of the sentences do not appear to be controlled in accordance with any considered plan. During the past twenty years much work has been done on vocabulary selection based upon word counts. The recent publication of Michael West's *General Service List of English Words* should go far towards helping those who wish to write for Pacific islanders to adjust their vocabulary to the capacities of their would-be readers. The fact that this service list is based upon semantic frequencies, not upon word frequencies, makes it an important advance upon the lists of the earlier *Interim Report on Vocabulary Section.* Yet it is not wholly suited to the needs of those who would write for the peoples of Oceania. The semantic frequencies have been estimated in terms of the culture of Western Europe and of the geographical environment of the temperate zones. This was, probably, inevitable since most of the material written in English, and upon which therefore the word counts were made, is the work of authors living in a European cultural environment and in the temperate zones. For this reason words relating to objects, customs and ideas common in such a cultural and physical environment are included (some of them with a high rating) which are at least alien, at worst unknown to the culture of the island villager. On the other hand many words are wholly omitted from the selected list for general use which are essential if some of the most common things and ideas of island life are to be expressed in English. For example, "cottage", "railway" and "snow" are important words in a European setting, but not in an Oceanic zone; conversely "banana", "coconut", and "trade store" (or "store") which find no place in the General List are among the first which an islander would need.

It would be a great help to the production of suitable reading matter in English for the Pacific islanders if a handbook could be produced giving a list of words suited to a vocabulary of 1,000 or 1,500 semantic forms, based upon Dr. West's General List but with amendments to suit the social and material environment of the islanders. Such a handbook is indeed urgently required for agriculturists, health officers and technical instructors. Conditions in the islands are such that many Natives are keenly interested in agriculture, health and simple technical skills. Where there is no such interest, it is vitally necessary to arouse it. But it is notorious that specialists in any subject are prone to forget, when speaking or writing on their subject, how many of the words they use are not those of common everyday speech and may therefore be unfamiliar to their non-specialist audience. Moreover they usually find it difficult to translate them into more simple English. Thus, what they write fails to be effective among those for whom they write.

The use of too great a variety of words is not the only vocabulary fault committed by many who write for the islanders. As Dr. West has pointed out, vocabulary selection must concern itself not with words but with semantics. In an effort not to use too many different words, one can easily err by using a few words in too many different senses. The English language has a great facility for creating verbs from nouns with no outward change of form that is shown orthographically, and also for developing the semantics of a word (through more and more tenuous metaphors). The creating of verbs from nouns gives little difficulty to the foreign learner for the semantic relationship is usually so close as to be easily apparent. But the extension, through metaphor, of the area of meaning of a word can cause great confusion. Frequently the chain of metaphors which links the diverse meanings of a single word is long and, unless one is very familiar with the English cultural setting, by no means obvious. There does not seem to be any sure evidence

whether it is easier for a person whose cultural background is not European to master three different meanings for one word or to learn three different words each with a distinct meaning. It is important for a writer to be aware when he is in fact using the same word in different senses, and that though these may seem clearly related to him they are probably not so clearly related in the minds of his readers as to be easily intelligible to them when the words occur in their different contexts. For example we easily forget that in the phrases "a deep hole" and "a deep voice", the word "deep" has two distinct (though to us related) meanings.

Words do not exist *in vacuo*. A word which is not related to something within the experience of the learner cannot have any meaning for him. This is a truism, though it is sometimes overlooked. What is less obvious is that an English word may stand for something familiar in the experience of the learner, but yet the intellectual concept which it presents to him, and the emotional response which it calls forth may be wholly different from those which it arouses in the thoughts and feelings of an English person. Thus, although the learner may successfully correlate word and object, he may easily give to the word a significance which is different from that which it has within the context of English culture. For example, the word "cow" to an English dairyman has a wholly different emotional content and probably a different intellectual content from what it has to a pious Hindu, even though the latter may have an excellent knowledge of English. To a Pacific islander learning English any such lack of correspondence between the English intellectual and emotional significance attaching to that which the word is used to denote (it is not necessarily an object) and the intellectual and emotional significance attached to that same thing in the culture of the learner, presents great difficulties in understanding written or spoken English. The islander may read a passage and may understand the dictionary meaning of every word in it, and yet be unable to grasp the significance of the whole.

This fact presents the would-be author, particularly the author of recreational books, with a very real problem. In writing a story one wishes to evoke an emotional as well as an intellectual response in the reader. This is achieved very largely by the use of words which have a definite emotional tone. From a number of words with very much the same meaning, the author selects that one which, by its associations, evokes the atmosphere which he wishes to create, on the assumption that the emotional content of the word, its associations, will be the same for his readers as for himself. But when writing in English for the non-English island peoples no such assumption is warranted. The range of words from which the author can choose is very restricted, and because of the difference of cultural background between himself and his readers, he cannot assume that the word he does choose will have for them the same associations and therefore the same emotional tone as for himself. This is true also of the emotional significance of certain phonemes which the good story-teller used in building up "atmosphere", phonemes such as sibilants, gutterals, and the wailing, woeful, weary, wandering English "w". In particular it is true in respect of the choice of similes and metaphors, as we can easily appreciate when we compare the social and emotional associations of a pig in English and in Melanesian societies.

It is important that those who prepare reading material for the islanders should first prepare themselves by becoming as familiar as they can with the cultural environment of those for whom they purpose to write, and that they should adjust their vocabulary in accordance with the knowledge thus gained. I believe that failure to do this in the past is very largely responsible for the seeming superficiality, and even slipshodness, of thinking which some Africans and Indians display when they are speaking and writing in English. They have learnt the "meaning" of the words they use, but they have not grasped their significance in the context of English culture. All too often the result is mutual irritation between the speaker and his English hearers, and a sense of resentment and frustration on the part of the speaker at what appears to him to be the Englishman's superciliousness and wilful lack of interest or appreciation.

(2) *Sentence structure.*

The use of a controlled vocabulary alone will not necessarily result in writings which the island reader can comprehend and enjoy. Equally important is the use of a simple sentence structure. This does not mean that all subordinate clauses should be eschewed, but it does mean that they should be severely restrained. The following passage, taken from a monthly paper issued for Papuan teachers, gives examples of over-complicated sentences:

> The British Empire has been fortunate in having men of great vision, among them Sir Stamford Raffles, who realised the great importance of the Strait of Malacca (see map), and secured Singapore for England in 1819. Through the Strait passes all the shipping between Europe or India, and Eastern Asia and Japan, so that Singapore is one of the world's busiest ports as it is the natural collecting centre for the grading and export of many tropical products such as rubber, spices, gums and resins.

For one to whom English is a foreign tongue such sentences must resemble the labyrinth of the Minotaur.

In imaginative writing the need for simple sentence-structure presents difficulties to the author similar to those presented by the need to use a controlled vocabulary. The creation of "atmosphere", the evoking of a sense of repose or of tension, the full use of the melody of words to produce the desired emotional effect, these are largely achieved by the subtle use of sentence rhythm in the paragraph, and by the rhythms of words and clauses within the sentence. When writing for those who are not at ease and familiar with English, the use of inversions, antitheses and other legitimate devices for conveying significant shades of meaning and emotional tone must be renounced.

In writing whose primary purpose is to give instruction, or to enlarge the mental horizon, every effort should be made rigidly to control the vocabulary and to use very simple sentence-patterns. The linguistic difficulties must be minimised, so that the reader can concentrate upon the facts or upon the new ideas which the author wishes to convey. In writings whose primary purpose is recreational such rigid language control is not necessary, always provided that the language difficulties are not so great as to prevent the reader from getting the gist of what he is reading and from enjoying it even though he may not understand every word. In writings whose primary purpose is to improve the reader's knowledge of English the vocabulary and sentence forms need to be closely tied to the carefully designed progressive lessons in English in accordance with which the pupil is being taught.

When considering the vocabulary and sentence forms which should be used, it is important to recognise that in fact spoken-English and written-English are not identical. It might seem obvious that written-English should be used in preparing reading material for the islanders. But is this really so? Most of the Oceanic islanders who are eager to learn English want to do so primarily that they may be able to speak it. They want to be able to speak it because they believe that this will be an important step towards economic, social and political equality with the Europeans who at present form an exclusive, dominant, governing and employer class. As a Papuan said to me, "We want to speak English as you speak it." If reading books in English are to help the islanders to achieve this aim, there is much to be said for using in them as far as possible the language of spoken-English. Another reason for doing so is that modern methods of language teaching emphasize the importance of oral

work—of the pupil becoming familiar with the sounds of phrases, and gaining facility in reproducing these sounds in their appropriate context. They also advocate (particularly for peoples who have no traditions of literacy) that for some two years or more what the pupil is given to read should not go outside the vocabulary and sentence forms with which he has already become familiar orally. Those who prepare scripts for broadcasting are accustomed to writing in spoken-English, but there are many people who still believe that the elisions and sentence patterns of spoken-English are a "degenerate" or "slovenly" or "ungrammatical" "debasement" of English. To such people it is anathema to produce books written in spoken-English. That their attitude derives from a misapprehension of the nature of language I believe, but to ignore it would be impolitic, particularly as it is an attitude common amongst teachers. Their antagonism may, however, be evaded, and spoken-English yet be used in reading material of all kinds, by the judicious use of dialogue. The use of dialogue has further advantages which will be examined when we come to consider the methods of presenting the subject matter.

The South Pacific Literature Bureau

The South Pacific Literature Bureau was established by the Commission three and a half years ago. Among its aims are: stimulating the production of cheap books, booklets, and pamphlets for the island peoples of the South Pacific area; publishing a quarterly list of recommended books; stimulating creative literary effort by the peoples of the islands themselves; assisting in the preparation and production of follow-up material essential to any literacy campaign; advising on reproduction apparatus, also essential to any such campaign; and giving information on the establishment and organization of village libraries.

During the initial years of the Bureau's work a survey was conducted to examine and compare the literature needs of the different territories in the area. This survey has made it possible to plan a publications programme, which covers a wide field, and upon which work has now commenced. The Literature Bureau is working in association with well-established and reputable publishing houses which will produce these books under the Bureau's guarantee of sales. In addition to arranging for the publication of books in English and French in this manner, the Bureau offers technical advice and assistance on the production of literature materials in the islands vernaculars. Moreover, the Bureau is often able to arrange for the production of books, booklets, and pamphlets which are required by territorial administrations and missions in the South Pacific who are prepared to meet the costs of production.

The Literature Bureau has established in Sydney a library of simply-written books of direct or indirect interest to the island peoples. This library is used as a basis for the reviews of books of general interest, or relevance to the educational and development problems of the South Pacific area, which have appeared each quarter in *Pacific Reading* and which will now continue in the *Quarterly Bulletin*. The Bureau is also able to supply information from this library in relation to the numerous requests which it receives from territorial administrations and educational establishments regarding the availability of simple reading matter covering numerous subjects.

Assistance has been offered to territorial administrations by way of donating prizes for literature competitions and by assisting in obtaining publication of prize-winning entries in these competitions which are for the island peoples. It is hoped that this will stimulate the creative literary work of island authors. During the last year the results of one of these competitions, and two of the prize-winning entries, have been published in *Pacific Reading*.

Exploratory work has been conducted by the Literature Bureau, with some success, to endeavour to find satisfactory solutions to the production at reasonable cost of literature materials in the very small editions which are so often required in the islands.

Many of the leaflets and pamphlets which the Literature Bureau has assisted in producing have not only helped to provide useful information but also acted as follow-up material for literacy campaigns.

The Literature Bureau's advisory service, covering many aspects of literature problems, including the inexpensive production of books, booklets, and pamphlets, and the establishment of village libraries, has been the subject of an ever-increasing volume of correspondence with the islands. Articles dealing with various aspects of literature matters have appeared in many issues of *Pacific Reading*, and will now appear in the *Quarterly Bulletin*.

A French Branch of the Literature Bureau, relying on a Committee of Patronage, was opened in Nouméa in March, 1954. Among its objectives are: liaison between the Literature Bureau in Sydney and the French territories in the Pacific; determining the type of publication likely to serve those who work in these areas, and establishing a list of possible users of these publications, e.g., administrators, heads of technical departments, educationists, and missions, etc.; establishing a library of works including printed matter and audio-visual material to meet these needs, taking an active interest in *Pacific Reading* and distributing copies of the French version of this material to French Pacific territories; preparing and finalising texts suitable for schools and for adult education in these territories; distributing in French Pacific territories all texts liable to suit the requirements of educational and cultural establishments; and finding means of publishing works originating from these establishments, after their acceptance by the Committee.

The French Branch has already made considerable progress in building up a list of names and addresses of persons interested in the purchase of publications. The library of works of interest to people in French Pacific territories is now well established and continues to be extended. The first educational book for use in native schools in French territories has been produced, and several more manuscripts are in various stages of production. Moreover, several filmstrips are in the course of preparation.

Filmstrip Production For The Pacific

It is now an accepted fact that the best visual aids for individual territories are those produced in, or with the co-operation of, those territories themselves. It has been proved that filmstrips showing local people have more success than foreign material, even though their technical quality may not be up to professional standards.

Commission Production Programme

To encourage local production the Commission is engaged on a series of filmstrips dealing with subjects of immediate concern to the area, and it is hoped that this material may be used by the territories as a starting point from which to build their own supply of visual aids. Apart from this, the exchange of ideas and materials between those concerned in producing local filmstrips cannot fail to be of mutual profit.

The recommendations of the South Pacific Conference and the Research Council have provided the Commission with a comprehensive visual aids production programme, including the following priority subjects: nutrition, malaria; hygiene and sanitation; maternal and infant welfare; dental defects; soil erosion and conservation; coconuts, cocoa and coffee; pests and diseases; and community development.

THE ISLANDS ENGLISH COURSE

by

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A new English course specially adapted to the requirements of Pacific schools.

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Work on this programme is now well under way and a number of completed strips have been circulated to selected territories for appraisal.*

Locally-Produced Filmstrips Urgently Needed

What is now urgently required is the local production of filmstrips on these and other subjects by Government officers, missionaries, planters and the many keen amateur photographers living in the islands. Thus only can an adequate supply of really useful material, adapted to local needs, be built up: filmstrips made in the Pacific and for the Pacific.

Assistance Available To Producers

Filmstrip production is not really difficult; certainly not beyond the powers of any imaginative and resourceful amateur photographer; and the making of a successful strip can be a fascinating as well as an eminently worthwhile occupation.

A number of Commission services, as detailed below, are now available to assist filmstrip producers in the Pacific Islands, who are cordially invited to apply for any help or advice which they may need.

i. *Provision of Film.* In cases where the subject matter and treatment is considered to be of general interest, film will be supplied by the Commission to local photographers on special terms.

ii. *Advice and Guidance.* Expert technical advice is available on such matters as the choice of subjects; the selection of material; technical problems; photographing the strip; and preparation of teaching notes.

iii. *Editing and Processing.* Photographs or negatives can be sent to the Social Development section for editing and processing into filmstrips. Extra copies of these strips may be obtained at cost price.

iv. *Titling.* Arrangements can be made for the provision of titles, captions and sub-titles.

v. *Drawings, cartoons and art-work.* Drawings or cartoons can be provided from photographs or from original ideas and suggestions. Arrangements can be made for maps, diagrams and all forms of art-work to be drawn.

vi. *Teaching Notes.* The typing and duplicating of teaching notes can be arranged.

vii. *Exchange of Information.* By notes and articles in the *Quarterly Bulletin* and answers to individual correspondents, the Commission acts as a general clearing house of information and experience for local producers in the various territories.

All enquiries on the above services, and other matters relating to filmstrips, should be addressed to the Executive Officer for Social Development, Box 5254, G.P.O., Sydney, N.S.W., Australia.

How To Make Your Own Filmstrips

Some of the most effective strips have been made by amateurs and no-one need be discouraged by the feeling that the work is too technical. There are, however, certain hints and suggestions which will make the way easier; and these are incorporated in a handbook recently produced by the Commission entitled *How to Make Your Own Filmstrips.* The author, Mrs. N. E. Phelan, was, prior to her appointment as Visual Aids Officer on the Commission staff, in charge of the Illustration Research Department of Common Ground, the well-known London filmstrip producers. She has therefore brought to its compilation many years of practical experience in all aspects of filmstrip production, from the taking of photo sequences to the final preparation of commentaries. All interested are invited to send for a copy.

* See *Quarterly Bulletin*, April, 1955, p. 35.

BOOK LIST No. 10

Items reviewed have been chosen for their general interest or for their relevance to educational and development problems in the South Pacific area. Wherever possible the price stated is the published price in the country of origin.

GENERAL READING

THE BOY WHO WAS AFRAID. Armstrong Sperry. London: The Bodley Head; A.10s.0d. 1942. pp.89. Illust.

The boy who was afraid was Mafatu, the Stout Heart, son of a Polynesian chief of early days; he feared the sea which had claimed the life of his mother and almost his own. His friends scorned his fear and branded him as a coward; he was subjected to the most painful of all mental punishments—ridicule. Eventually Mafatu could no longer bear the humiliation which he was made to feel, so he set out in his canoe with his dog and his pet albatross. After many days at sea he met a great storm, his canoe was wrecked and he was cast upon another island. On this island he met many adventures and his courage was tested and proved. After some time he was able to build himself a fine new canoe, and, pursued by cannibals of the islands, he made his escape and returned to his own island, where he was welcomed and praised as truly Mafatu, the Stout Heart. Originally written for English children, this fine tale of Polynesian bravery, skill, and ingenuity, will be welcomed by those islanders with sufficient knowledge of English to understand the fairly simple manner in which it has been written.

THE INSECT MAN. Eleanor Doorly. London: Penguin Books; stg.1s.6d. 1949. pp.165. Illus. (*Puffin Story Books*)

This book has been designed to bring to even the youngest children the work of 'le grand entomologiste'. Perhaps most of us who have read his books will have felt—this is more exciting than fiction! All, we are sure, who have read Fabre's books will have admired his enormous patience, and shared with him, through his beautiful writing, the supreme delights which rewarded that patience. The excellent English translations of Fabre's books may possibly be too advanced for the very young, and perhaps this book will act as an introduction to entomology and to Fabre.

The book describes how an English family set out in a car to discover something about Fabre for themselves. They start out from St. Léons, his birthplace, and trace his life through all the places in France where he lived and worked. There is of course much of biological interest, but the majority of the book is confined to the work and discoveries of Fabre and there are lengthy quotations from the English translations of his books. Once again we enjoy reading of things which man's ingenuity can hardly match; such as the female Digger-Wasp, who, with her accurate knowledge of anatomy, paralyzes her prey, the beetle, by a sting in the only nerve centre of its body. Having done this, she trundles the beetle, which is nearly twice as large as herself, to a deep hole she has dug and then lays her egg on the beetle, so that when the grub is hatched it will have a plentiful supply of fresh meat. Happiness and sudden death—is the story of the bridal dance of the scorpions, which leads to the nuptials, consummation, and the untimely death of the male at the hands of his hungry bride. Yet, in spite of her apparent ingratitude for the blessings of motherhood which the male bestows upon her, she then proceeds to behave as the ideal mother and cares for her young with the utmost gentleness. The ways of these creatures which Fabre studied are to us grotesque—perhaps, if blessed with intelligence, they would find our ways no less macabre.

Here, then, is a book which will perform the object of Fabre's own words: 'what matters in learning is not to be taught but to wake up'.

FAR-AWAY TALES. Erle Wilson. Sydney: Australasian Publishing Co.; A.5s.9d. 1954. pp.96. Illust. (*The York Series*)

Apart from type, which is a little too small, this book has been well produced. The illustrations are clear and will amuse. It is one of a series of nine, all of which are intended for children from seven to ten years. The short stories in *Far-Away Tales* cover the Pacific from New Zealand to China and Australia to the Marquesas, and although the story-telling is not of the highest standard, the book is worthy of mention as it is one of the few which we have seen, at a fairly simple level, that has a Pacific background.

HOW MUCH AND HOW MANY. Jeanne Bendick. New York: Whittlesey House; $2:50. 1947. pp.188. Illust.

This book has the subtitle "The Story of Weights and Measures". It has been fairly simply written and amusingly illustrated with line drawings. It covers in a comprehensive manner the various weights and measures in use by different countries. The origin of these weights and measures and their adaptation and evolution to their present forms and uses is discussed. What could so easily have been a dull and uninteresting book has been treated in a light and amusing manner; and the author has succeeded in making this subject both readable and enjoyable. The two largest parts of the book cover the use of weights and measures in trade and in science; and in these sections are chapters on 'Shipping and Commerce', 'Money, Jewels and Precious Metals', 'Apothecary Weight and Liquid Measure', 'The Things We Wear', 'Building', 'Printing', 'Electricity, Light and Heat, Radio, and Mechanics', 'Time', 'Navigation', 'Weather', 'Surveying', 'Cooking', 'Medicine', 'Photography', and 'Guns and Ballistics'. This book may prove too advanced for many island peoples; the examples that it uses may often prove irrelevant to island conditions, but in spite of this it is worthy of consideration and should prove an interesting and useful source material for classroom work.

CRANES FLYING SOUTH. N. Karazin. London: Penguin Books; stg.1s.6d. 1948. pp.143. (*Puffin Story Books*)

This book was first translated from the Russian in 1936; and it answers many questions about that most fascinating subject—the migration of birds. It is written as from the mouth of one of the birds who describes events from—literally—a bird's eye point of view. Written with great beauty and simplicity the story follows the course of the birds' migration from their native marshes, north of Moscow, to the Nile and down to Khartoum. The habits of the cranes are most interesting, and one learns of their watchmen, leaders, and scouts. Throughout there is much descriptive matter of the scenery, the people and places they see on their route, and of the adventures they meet. Humour is not forgotten, and it is most interesting to see the foibles of humans from a crane's viewpoint. The publishers are perhaps not far wrong in claiming that this book is suitable for almost anyone over eight years old.

THE CHINESE BUBBLE MAN. Pauline Pidgeon. London: Nelson. Stg.11d. no date. pp.22. Illust. (*Speedwell Readers*)

Designed for English school children aged 7-11, these readers are graded and divided into four series, each containing about twenty books. They are simply written with short

sentences and paragraphs. They may prove of interest and use as alternative supplementary reading in the early primary school years. The book under review is a charming little story of the efforts of two young Chinese boys to obtain a bubble pipe for Ching Chong, who is their favourite story teller. The illustrations are clear and amusing drawings, the type is large and easy to read.

ON THE BAT'S BACK. McEwan Lawson. London: Lutterworth Press; stg.8s.6d. 1950. pp.132. Illust.

This book is primarily intended for English children, but it is by no means a childish book. It is a biography of Robert Louis Stevenson, and gives an accurate and interesting account of his struggle against ill health, and describes his maladjusted ways and outlook which brought him into conflict with almost everyone, including his friends. His bravery and perseverance in the face of so many difficulties, and his unceasing struggle to become an author of note, have been dealt with by the author in a sympathetic and understanding approach and will make this book of great interest in the Pacific. Perhaps it will be of greatest interest in Samoa where the memory of Tusitala (the "teller of tales") still lives on vividly, and where he is still recognized as one of the greatest friends of the Samoans.

SOCIAL STUDIES

BRITISH EAST AFRICA. M. Parker and George Noyle. London: Macmillan; stg.2s.3d. 1954. pp.64. Illust. (*Glimpses of Family Life*)

This book has been pleasantly illustrated in two-colour drawings and is printed in good clear type. It is an approach to social studies through the story of one East African family and it examines their way of life. Other titles in the series include *The U.S.A., Nigeria, Sweden.* About sixth year of English level.

SHIPS. Harry Robinson. London: Longmans Green; stg. 3s.6d. 1954. pp.64. Illust. (*Men at Work*)

This is the latest addition to this excellent series. Titles previously published are *Coal, Houses, Textiles,* and *Farms.* The title under review covers ships from the very earliest days of the coracle to modern days and the 'Queen Elizabeth'. The illustrations are sufficiently numerous to act as an interpretation of the book without the necessity of reading the text; although in fact the simply written text does enlarge considerably on the informative pictures.

AIDS TO SCOUTMASTERS IN EAST AFRICA. J. Stephen Smith. Nairobi: Eagle Press. E.A.Shgs.1/50. 1951. pp.49. Illust.

For those who wish to introduce the scouting movement to the islands, or for those who wish to learn more of scouting to enable them to further work already started, this book will be of interest. The author was responsible for the introduction of Scouting to Africans in Kenya in 1937 and has given here, information that may encourage Scoutmasters to correct mistakes and to improve the standard of Scouting in their Troops. The chapters of the book are entitled 'What is Scouting', 'Scout Organisation', 'Scout Law', 'Badge Work', 'The Scouter and Registration of a Group', 'Troops and Patrols', 'The Patrol System', 'The Troop Meeting', 'Interpatrol Games and Tests', 'Prepared Tests on Tenderfoot', and 'Camping'; the book concludes with a useful bibliography and an index. The information in this book is clearly set out and readily understandable and most of it is applicable equally to the Pacific or any other area.

RUBBER AND IT USES. Herbert McKay. London: Oxford University Press; stg.1s.10d. 1940. pp.76. Illust. (*Men and Women at Work*)

This interesting and informative book traces an outline of the history of rubber, its cultivation and production, and its uses. Columbus discovered rubber being used for balls in America, and the book describes its early development in America and how the rubber trees of Brazil were chosen as the most suitable for cultivation. Seeds and plants were sent to Kew Gardens near London, and were used to start plantations in Ceylon and the Malay Peninsular. Chapters of the book deal with: rubber plantations, plantation factories, sponge rubber, making rubber tubes, tyres, tennis balls, golf balls, mackintoshes, the manufacture and use of vulcanized rubber, and many other interesting aspects of rubber. This is one title in a useful series designed for third to sixth year reading and written in a 1,500-word vocabulary.

MANUAL ARTS

WOODWORK FOR FIRST YEAR. John A. Walton. Sydney: Australasian Publishing Co.; A.4s. 1950. pp.63. Illust.

This book is based on the theory syllabus for first year woodwork classes in New South Wales secondary schools. It covers the first year's work in twenty-six lessons; and home-study and test questions are included to assist students in revising each topic. The really good, clear diagrams are most useful; many of them are drawn over half-inch squares to assist students copying the sketches. Each tool is examined and the materials of which it is made are mentioned, then follow the uses to which it is put. On each right-hand page are diagrams, illustrating the text on the left-hand page. This book could form a most useful supplement to any woodwork course.

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HEALTH

JUNIOR FIRST AID MANUAL. 4th Ed. British Red Cross Society. London: Educational Productions; stg.2s.6d. 1952. pp.66. Illust.

This book is designed to present the subject of First Aid at a level suitable for use by English school children, about fifteen years old. The 'visual' method has been followed, the text being reduced to absolute essentials, and then made crystal clear by the prolific use of three-colour line diagrams. The whole thing is most attractively produced and we strongly recommend its examination by our readers in the islands; the fact that it was originally produced for English school children in no way detracts from its usefulness.

FIRST AID ILLUSTRATED. H. T. H. Butt. London: Longmans Green. Stg.3s.3d. 1938. pp.93. Illust.

This book grew out of the need for first-aid in the gold and coal mines of South Africa. Much interest had been taken by the African miners in first-aid work and it was decided to produce this book in which theoretical tuition has been kept to a minimum and the practical side of the work has been made clear by photographs. The book gives the basic and essential needs for first aid equipment and methods, and outlines the equipment required; types of bandage and how to tie them; how to stop bleeding with fingers, a pad and bandage, or tourniquet; how to bind up broken bones; and how to carry the injured. The photographs which illustrate this book are not of a high standard but do make the instructions and methods quite clear. The text is simple and there is little doubt that the book will be readily understood by those people in the islands with a moderate understanding of English.

SCIENCE

GENERAL SCIENCE WORKBOOK FOR TROPICAL SCHOOLS, Books 1 and 2. A. Atkinson & F. Daniel. London: Oxford University Press. Book 1, Stg.2s.6d. Book 2, Stg.5s.6d. 1954. pp. 65 and 160.

The 'self-testing' exercises in these books were devised by the authors for use in their own classes as they had found that large classes and the consequent vast amount of correction of essay-type homework exercises left them little time for other teaching exercises. The exercises proved very helpful in the authors' experience and they therefore decided to publish them and thus make them available to others. The 'self-testing' exercises in this book are not, however, designed to entirely replace written homework and oral classwork, and they should be used in addition to these more conventional methods. One of the authors, F. Daniel, previously wrote the books in the *General Science for Tropical Schools* series, published by Oxford University Press, and the books under review, while designed for all students of General Science, are arranged in the sequence adopted in *General Science for Tropical Schools.*

PHYSICAL TRAINING

HOW TO MARK OUT FIELDS, GROUNDS, COURTS, AND TRACKS. F. E. V. Ross. Nairobi: Eagle Press; stg.2s. 1954. pp.28. Illust.

There are many books which describe games and give the sizes of the grounds, but there are very few, if any, which have previously dealt exclusively with simple methods of marking out the grounds. This book will be found valuable by teachers and others connected with the organizing of sport. It describes how to mark out grounds without instruments and with the use of only a tape measure and a good supply of pegs and string. The games, etc., that are dealt with in approximate order of difficulty in marking the grounds are: Volley Ball, Quoit Tennis, Net Ball, Tennis, Badminton, Basket Ball, Football, Hockey and Athletics Track, with Football Field inside. There is a diagram for each game and the instructions for marking the ground are clear.

ARTS AND CRAFTS

PICTURE MAKING. K. M. Trowell. London: Longmans, Green; stg.1s.9d. 1952. pp.31. 121 illust. (*Art Teaching in African Schools*)

This book has been designed to assist African teachers in the teaching of painting. In Africa, as in most parts of the Pacific, there is no tradition of painting upon which to base instruction, and the approach of this book to its subject is consequently equally applicable to either area. *Picture Making* is not a text book or a list of instructions, and its helpful approach is calculated to greatly assist in attaining the atmosphere that is essential for encouraging creative work and allowing free play to imagination among children learning to paint. By simple analogy the author lucidly states what art is not; and she examines briefly the qualities of a good painting. She successfully relegates accuracy in drawing to its rightful place as only one of the qualities of a good painting; and she emphasizes the necessity of allowing the child to work from his own ideas and not allowing him to copy other work, any more than he would be allowed to copy other pupils' essays in the English class. The longest chapter of the book is devoted to the subjects children choose for pictures and how they express them; twelve illustrations of actual examples are given in this chapter. From these actual examples an examination is made of most of

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the qualities which are essentially part of a good painting; composition and balance of form, design, colour, tone, and texture. The concluding chapter gives suggestions to the teacher on helpful ways of criticising the pupil's work, and teaching the pupils to discuss their own work. This book is well worth reading for the helpful manner in which it has approached a very difficult subject, quite apart from its undoubted value for those who teach art. Very few books on this subject, suited for overseas teachers, are available and this will rank high among the few there are. Other books in the series are *Design, Materials,* and *Basketwork.*

REFERENCE BOOKS

OXFORD JUNIOR ENCYCLOPAEDIA (VOLUME I: MANKIND). General Editors: Laura E. Salt and Geoffrey Boumphrey. London: Oxford University Press; stg.25s. 1948. pp.496. Illust.

This is the first of twelve volumes designed to provide an introduction to all subjects of general interest. We endorse the statement of the editors in their preface: "To many children (and indeed to many adults) reading is not a natural activity: they do not turn to books for their own sake. But they can be trained to go to books for information which they want for some particular purpose—and thus, very often, to form a habit which will be of lifelong value". Although there are no large reference books or encyclopaedias especially produced for the islands there are several which are of potential value for island libraries, and this is indeed one of them. It may be thought that this Encyclopaedia will be somewhat advanced for most islanders, and this is probably true, but as there is nothing specifically designed for them in this field and as it is just as easy to underestimate their requirements and abilities as it is to overestimate them, it might be worthwhile to see if they will enjoy reading or merely looking at this book. This volume, dealing with Mankind, covers Evolution, Ancient World, Races and Nations, Religions, Mythology, and Folk-lore. The cross references, which are profuse, either appear in the text and refer to further articles amplifying the particular point under review, or appear at the end of an article and refer to others taking the whole subject further. Like any good encyclopaedia, this has been abundantly illustrated and slightly more than a quarter of the total printed area is devoted to illustrations: mainly black and white photographs, a few in colour, and drawings and diagrams. An introduction entitled 'How to Use This Book' will probably prove most helpful. The text has been kept reasonably simple and clear in as far as this was possible in describing accurately and concisely the point under review.

DO YOU KNOW? R. E. Gregory. Cape Town: Longmans, Green; stg.1s.3d. 1947. pp.42. Illust.

This book, produced for overseas readers, is the smallest and least expensive reference book in our library. It answers fifty-two questions ranging from 'Why a Wedding Ring Is Worn' to 'Why an Outlet Pipe Is Bent' and from 'How the Stars and Stripes Came into Being' to 'How a Bicycle Pump Works'. It is calculated to act as an introduction to idle curiosity (Is curiosity ever idle?) rather than as a profound book of reference. Written in simple English.

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Australian Books of The Year

(Continued from page 38)

standards higher, two Commission-sponsored books were included in the seventeen "Best Books" in the general class and one among the four school text-books.

Of particular interest is the fact that one of the two general books is Ida Leeson's *A Bibliography of Bibliographies of the South Pacific,* which was produced in similar format to the other works in this now familiar Commission series. The judges' comments on this book were as follows:—

> The whole production is simple yet dignified. The white spacing on each page is well balanced and the letterpress is uniform throughout. The cloth used in the binding is of fine quality and the lettering perfect. The jacket is of a standard design. The index would have been more effective if set in double column.

The second general book, Cyril S. Belshaw's *Changing Melanesia,* the publication of which was assisted by subsidies from the Institute of Pacific Relations, and the Commission, was also highly commended by the judges.

In the text-book section the South Pacific Literature Bureau scored with their very first publication venture, Anare K. Raiwalui's *Na i vosavosa vakaviti e so—a Book of Fijian Idioms,* concerning which the judges said:—

> A text-book should be just as attractive and pleasing to the eye as any other book. This book has those qualities. The typography cannot be faulted. The cover has been attractively conceived and colours well maintained. A little more care was needed in the printing of the type pages.

Although the Commission, when subsidizing or guaranteeing publications in furtherance of its work programme, can and does place manuscripts with a number of publishing houses, its special thanks are due to the Oxford University Press, the publishers of the standard Commission series, for the sympathetic and favourable manner in which they have always dealt with its problems.

VISUAL AIDS

Films in the Commission library are marked with an asterisk before the title, and are available for viewing by any metropolitan or territorial government on application to the Executive Officer for Social Development, Box 5254, G.P.O., Sydney, N.S.W., Australia. Age classifications, where given, are intended as a guide rather than a recommendation.

THE INTERDEPENDENCE OF POND LIFE. 16 mm. 10 min. Black and white. Sound. Gaumont British Instructional. Price apply.

Microphotography and speeded-up photography are used in this film to show how each type of pond life depends on the others. Dead plants, bacteria, infusoria, insects and fish, all feed on each other in a kind of circle, and the refuse from all this feeding goes to make mud at the bottom of the pond. On the mud grow water plants which eat up carbon dioxide in the water but breathe out oxygen on which the fish depend; and the fish in turn produce the carbon dioxide needed by the plants.

There are some fascinating pictures of gnats and mayfly larvae, different kinds of worms, water fleas and so on.

BEETLES. 16 mm. 10 min. Black and white. Sound. Erpi Classroom Films. Price £A.20.

Three beetles common in America are the subject of this film, the tiger beetle, Japanese beetle, and the ladybird. All three insects are shown in the different stages of their development—as larvae, pupae, and finally as adult beetles. There is a reference to the widespread damage done by the Japanese beetle and methods of controlling it, and by contrast the ladybird is shown helping to destroy garden pests that attack plants. Microphotography has given such interesting pictures as a Japanese beetle attacking a centipede, a ladybird eating an aphid, and a number of pictures of the metamorphosis of each beetle.

THE COMMON COLD. 16 mm. 10 min. Black and white. Sound. Encyclopaedia Britannica Films Inc. Price approx. £A.20.

A weighty little discourse on the dangers of getting a cold. A little boy has caught a slight cold which prevents him playing baseball. He resents this until the doctor explains to him all the illnesses that can develop from such an infection, from sinus trouble to pneumonia. One useful feature of the film is that it points out that early cold symptoms are often very similar to symptoms of something far more serious and should therefore not be neglected.

ANTARCTIC WHALE HUNT. 16 mm. 20 min. Black and white. Sound. This Modern Age. Price approx. £A.40.

This is a rather exciting film which has some wonderful pictures of icebergs, blizzards, whales and harpooning. A cameraman went to the Antarctic with the modern whaling ship, *Balaena*, and a record was made of the whole process from catching the whale to marketing its products. The harpoon guns, manned by Norwegians, operate from catcher boats and the whales are taken on board the *Balaena*, which is really a floating factory. On board, the whale is cut up and its oils are processed for soap and margarine, meat meal is made for cattle, and bone meal for use as fertilizers. These products are packed ready for sale before leaving the ship. *Balaena* is oiled at sea by a tanker, which also brings out supplies and mail and takes away boxed products from the factory ship. Two questions asked at the end of the film are: "Are too many whales being killed; should there be more control, in the way of longer closed seasons?" and "Can whales be killed more humanely?" for modern methods of harpooning still leave much to be desired. A very interesting film.

*COAST EROSION. 16 mm. 10 min. Black and white. Sound. Gaumont British Instructional. Price £Stg.10.10.0.

A short, straightforward account of the ways in which the sea can break down and wear away the coast line. Photographic sequences show how water breaking on a cliff face can eventually cause cracks which grow until whole areas of the cliff break off, and this process is then recapitulated in animated diagrams. There are also sequences showing how the sea can eat through layers of soft rock and isolate hard rock along the coast and how it gradually washes away surfaces not strong enough to resist its continual action.

DRAWING WITH PENCIL. 16 mm. 10 min. Black and white. Sound. Encyclopaedia Britannica Films Inc. Price approx. £A.20.

A rather dull little film which shows something of the technique of pencil drawing. An artist is shown at work on a drawing of a house and we are permitted to see how he sharpens his pencils to give different surfaces for different purposes, how he gains effect by the use of pressure on the sharp and flat of his pencil, how he makes his preliminary sketches, how he uses a rubber, and how he makes use of light and dark values. The subject is interesting, even to those who don't draw, but the depressing thing about the film is that, despite his technical skill, the artist succeeds only in turning a charming old building into a commonplace drawing.

TROPICAL MOUNTAIN ISLAND: JAVA. 16 mm. 20 min. Black and white. Sound. Louis de Rochemont Associates. (*The Earth and Its People series*). Price approx. £A.40.

The main theme of this interesting film is a train journey from a coastal city up into the mountains of Java. The train takes needed supplies up to the people in the mountains and on the way back stops to pick up different products of this rich island—raw materials for quinine and rope making, cocoa, kapok, tea, rice, sugar and rubber. There are sequences showing the growing and harvesting of each of these products and something of the people working on the farms and plantations. (One extraordinary sequence, showing kapok being shaken out into a great net tent, is like a magnificent snow scene.) In the background are lovely glimpses of terraced rice fields and there are a few fascinating shots of the temples of Central Java and the old picturesque warehouse quarter of Djakarta. The commentary is satisfactory and the whole film is intelligently and attractively produced.

EBB TIDE. 16 mm. 10 min. Black and white. Sound. Gaumont British Instructional. Price £A.30.

This little film is about some of the animals and fish that are left behind when the tide goes out on an English beach. There are speeded-up sequences of starfish sinking (so it seems) into the wet sand, the weird heart-urchin burrowing into the sand, different kinds of worms eating, wriggling, and burrowing, crabs and fish that also hide themselves. There is here a great similarity to the film *Marine Sand Animals* reviewed some time ago (*Pacific Reading*, No. 3, June, 1953) The commentary is rather silly and full of forced humour, but some of the cutting and music is witty, particularly a little sequence on worms. A general interest film.

DO YOU KNOW. 16 mm. 13 min. Black and white. Sound. Produced by Lyle Disher, Australia. Price apply.

A sort of general knowledge film which asks questions, gives a variety of answers, wrong and right, and then tells the correct answer. The questions asked are: what is a topiarist and what is a decathlonist, and the answers given to choose from include white koalas, modellers in cement, athletes, men who draw on packing cases with hot needles, men who trim hedges into strange shapes and a swimming cat. The cat wandering out of the surf is a memorable sight.

ATLANTIC TRAWLER. 16 mm. 20 min. Black and white. Sound. Ministry of Information. Price approx. £A.30.

It was probably the intention of this film to give some idea of the monotony and hardship of the lives of men working on British trawlers, and if so, it succeeds, for it seems to drag interminably. In this particular case the general sombreness and grimness is enhanced by wartime conditions which bring active danger into the scene. The film proceeds at a most leisurely pace and the work at sea goes on, with night and day fishing and regular hauling in of the catch. When the trawler returns to port after two weeks at sea the men have only two days with their families and somehow the film becomes even more depressing at this stage, for their longed-for shore life is almost as drab as their existence at sea.

At the end of the film the narrator explains that on her next voyage the trawler in which the film was made was lost with all hands. A general interest film.

CYPRUS IS AN ISLAND. 16 mm. 35 min. Black and white. Ministry of Information. Price £A.50.

Viewing this film was a very agreeable experience, for it is interesting, informative, and in many parts visually beautiful. It should appeal to anyone who is interested in the people of other lands and the way they live. It starts with a short historical introduction, during which the camera ranges over the countryside and dwells on ruined buildings left behind by successive invaders and inhabitants of the island, and then takes up the story of present-day Cypriot life and the changes brought about by British administration. The main focus of attention is the improvements in rural life—efforts to increase farming, to control goat breeding (which in the past seriously menaced crops) and the introduction of irrigation, all this factual material being presented against a background of photography that conveys the atmosphere of this arid, picturesque island.

DEFEAT TUBERCULOSIS. 16 mm. 10 min. Black and white. Sound. Ministry of Information for Ministry of Health. Price approx. £A.12.

The story of two sisters living and working together. One of them is tired and run down and the other one, who seems in good health, takes her to the doctor. The doctor sends them both to be X-rayed for Tuberculosis and it is discovered that the girl who appeared sick is quite healthy, but the apparently healthy one has Tuberculosis. She is sent to a sanatorium for rest and treatment and is finally shown cured. The film is simple and clear; it shows that exterior appearances can be misleading in the case of Tuberculosis, that early treatment can cure the disease and that certain simple precautions can be taken to check its course.

Filmstrips

A TOOTHSOME TALE. Produced by the National Film Board of Canada. Colour. 31 frames. Captions. No teaching notes. Published price stg.25s.

Subject: Care of the teeth.
Medium: Cartoon drawings.
Technical Standard: Good.
Comment: A story about Mordecai Molar, who looked a sight, neglected his appearance and particularly his teeth, but was quite self-satisfied until his friends undertook to tell him the truth. As Mordecai hears of the results of neglect and laziness he becomes more and more horrified and finally decides to do the right things to preserve his teeth; clean them regularly, eat correct foods, visit the dentist twice a year. At first showing the strip seemed a little involved, but has plenty of life and movement and contains good advice. . . . . 12 + ages.

YOUR EYES. Produced by Basic Films Ltd., London. Colour. 22 frames. Captions and subtitles. Teaching notes. Published price stg.21s.

Subject: Structure and care of the eyes.
Medium: Coloured drawings. Diagrams.
Technical Standard: Good.
Comment: Structure of the eyes, their position in the head, the optic nerves, vision, eye defects, sight-testing and general care of the eyes are all touched on in this filmstrip. Pictures and notes explain the delicate mechanism of the eyes and make commonsense recommendations for their care and protection; and the strip, being simple and clear, serves as a useful introduction to the subject. 12 + ages.

TUBERCULOSIS. Jet series. Produced by the Christian Medical Association, India. Black and white. 24 frames. No captions. Teaching notes. Published price A.16s.9d.

Subject: Tuberculosis.
Medium: Drawings.
Technical Standard: Average.
Comment: The moral of this tale is that if you have T.B. and do not take the right precautions, you may kill other members of your family. Ganpat coughs germs all over the house, his wife and baby catch the disease and his wife dies. To avoid this kind of thing we should observe certain rules of simple hygiene which help to protect other people. The little stick figures in the filmstrip are very graphic and animated and tell the story quite well. They are reproduced as a set of cards intended for class use. . . General.

THE SAFE VILLAGE WELL. Jet Series. Produced by the Christian Medical Association, India. Black and white. 21 frames. No captions. Teaching notes. Published price A.16s.9d.

Subject: How to protect your drinking water.
Medium: Drawings.
Technical Standard: Average.
Comment: People who drink water from polluted wells become ill; so the only things to do are to protect the well and to sterilize the water. Different ways of making wells are shown in this little strip, and it is recommended that doubtful water should be boiled before drinking. Illustrated with stick figures and accompanied, as others in the series, by cards reproducing each frame. . General.

POTTERY FROM CLAY. Produced by British Instructional Films Ltd., London. Black and white. 27 frames. Subtitles. Teaching notes. Published price stg.12s.6d.

Subject: Pottery making.
Medium: Photographs.
Technical Standard: Above average.
Comment: An outline of pottery making in England at one of the big potteries. After preparation of the clay the photographs show shaping; throwing, jiggering, jolleying and slip-casting; then drying and first firing; glazing, firing and decorating; and finally, the last firing and packing. The pictures are interesting and informative and give a good idea of this always-fascinating occupation. 12 + ages.

PLANTEZ DES ARBRES. Produced by the Centre Audio-Visuel d'Haiti, Department de L'Education Nationale. Black and white. 24 frames. No captions. Typed commentary in French. Published price A.36s.

Subject: Importance of planting trees.
Medium: Drawings.
Technical Standard: Average.
Comment: Ti-Jean needs timber, and he cuts down trees wherever he feels like it, but makes no effort to replace the trees he has removed. Before long he has entirely denuded a well-wooded hillside and is about to start on another place when an Agricultural officer appears on the scene. He explains to Ti-Jean that each time a tree is cut down a new one must be planted, otherwise the land will be ruined by exposure and erosion. Ti-Jean listens to this advice and each time he cuts down a tree his wife plants a new one. In this way he can have a house, furniture and other comforts from timber without destroying his land. . . . . General.

PETIT JEAN NE SAVAIT PAS LIRE. Produced by the Centre Audio-Visuel d'Haiti, Department de L'Education Nationale. Black and white. 32 frames. No captions. Typed commentary in French. Published price A.36s.

Subject: Value of literacy.
Medium: Drawings.
Technical Standard: Below average.
Comment: This is the old story of the peasant who is swindled because he cannot read. Ti-Jean's mother has died and he needs money for her funeral. The money-lender provides money but gets Ti-Jean to put his cross on a document which binds him to give up his bull. Unable to read, he signs his animal away and is desolated when later on the money-lender claims it. His wife persuades him to learn to read and as a result he is able to view life with greater optimism. . . . . General.

PEPPO. Produced by the National Film Board of Canada. Colour. 45 frames. Captions and subtitles. No teaching notes. Published price stg.25s.

Subject: Nutrition.
Medium: Cartoon drawings.
Technical Standard: Good.
Comment: Peppo is a little cartoon figure who explains the importance of correct diet. He explains that in order to be healthy and have strength to work and enjoy life a balanced diet is necessary; he then goes on to describe what a balanced diet must include and to give examples of the foods in which are to be found the essential vitamins, proteins and minerals. The strip is cheerful and attractively presented and the lesson well explained. . . . 12 + ages.

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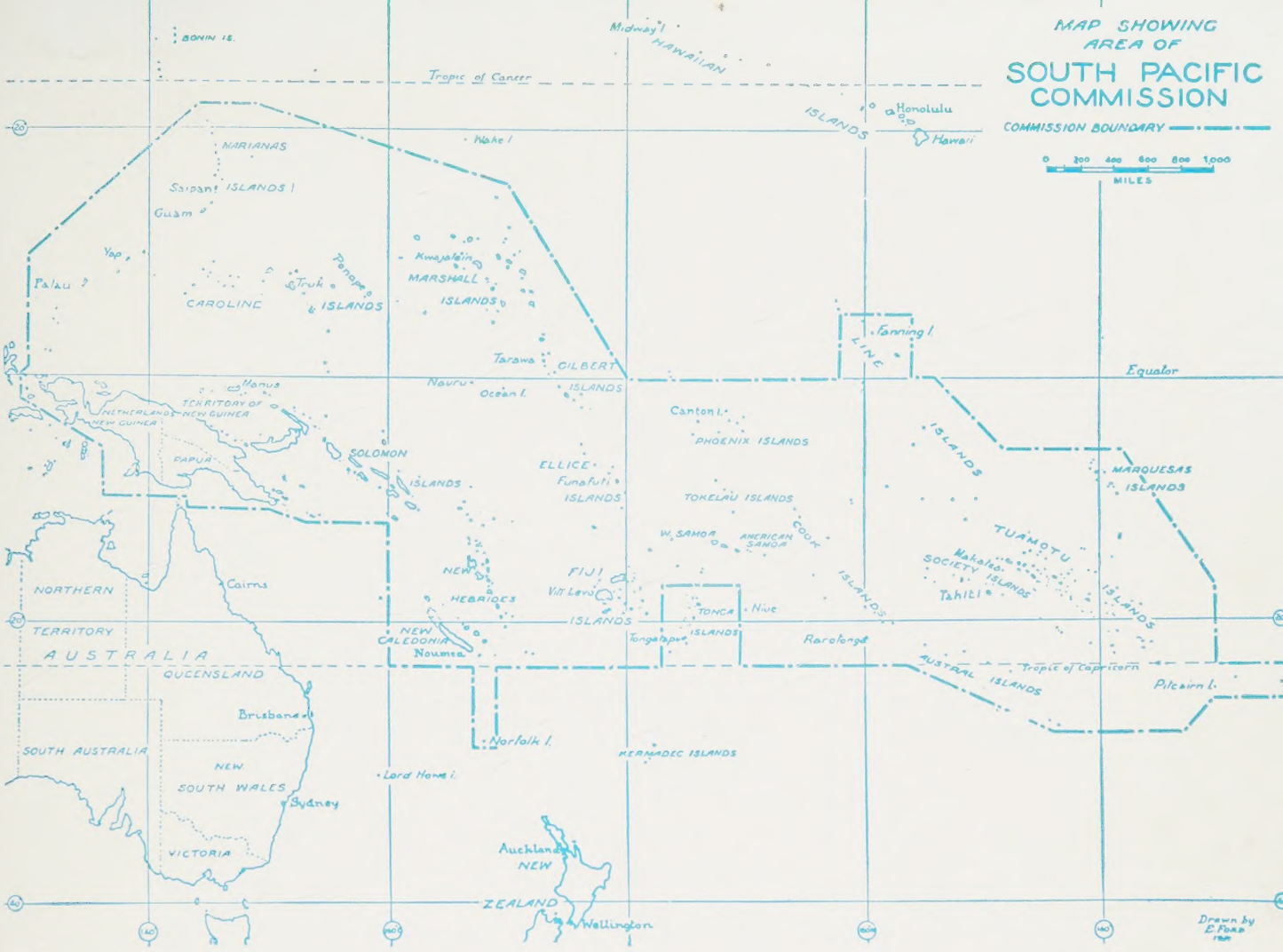

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